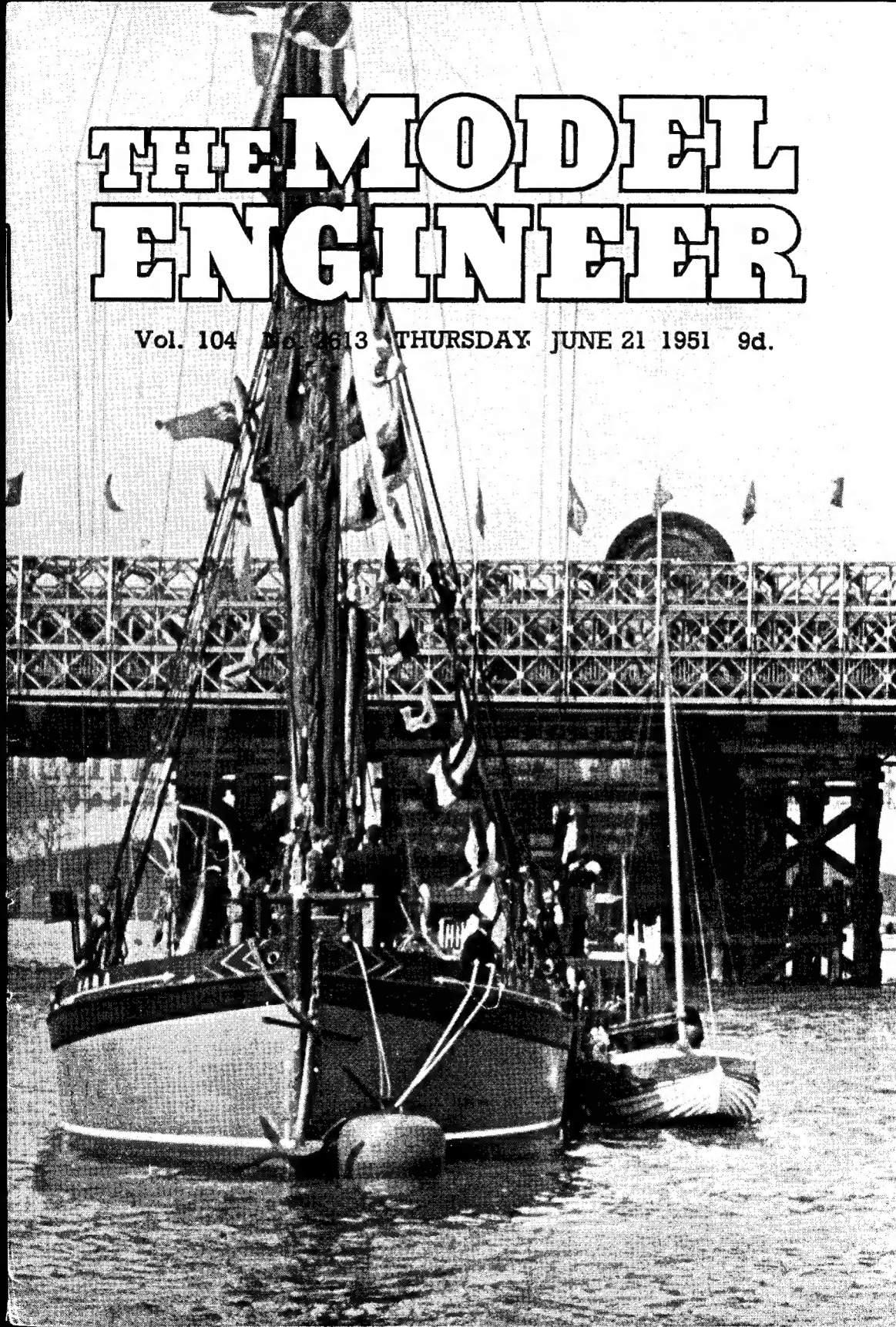


THE MODEL ENGINEER

Vol. 104 No. 2613 THURSDAY JUNE 21 1951 9d.



The MODEL ENGINEER

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21ST JUNE 1951



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SMOKE RINGS

Our Cover Picture

● THE PHOTOGRAPH this week depicts an extraordinary selection of subjects which should be of interest to readers. In the centre, the famous Thames barge, *Sara*, is seen from an unusual angle as she rides to her moorings off the South Bank site of the Festival of Britain.

To port, alongside *Sara*, lies the diminutive home-made ocean voyager, *Nova Espero* which, in 1949, gained world repute for her 43 days Atlantic crossing from Dartmouth, Nova Scotia, to Dartmouth, Devon. She was designed by the brothers Stanley and Colin Smith on board the liner *Aquitania* en route to Canada, and was built by them in the dingy cellar of a disused chapel in Halifax, Nova Scotia, in a period of less than three months. As these words are being written, the *Nova Espero* is once again somewhere in the North Atlantic, bound on a voyage of over 5,000 miles non-stop from Britain to New York, as a Festival contribution.

In the background can be seen the famous bridge which, we are told, occasioned no small manner of concern when it decided, entirely against the better judgment of its constructors, that a Festival bridge would be far more novel, running *beneath* the Thames than above it! We are now happy to see that the constructors won their point and intending visitors are assured that they will not be required

to resort to diving suits and weighty oxygen containers!

"M.E." Index, Vol. 104

● WE MUCH regret that, due to the present difficulties affecting printing, paper supplies and other matters connected with the publishing industry, we shall be unable to provide an index to be bound in with the last issue of the present volume. Our only course, therefore, is to print the index separately, as we did during the difficult times during and immediately following the war, limiting the number so as to meet the actual demand.

Will every reader who really requires a copy of the index, please advise us at once, enclosing an envelope large enough to take the "M.E." flat, stamped with a 1½d. stamp and addressed to himself? He will receive his copy of the index as soon as it is available.

An Old Fire Engine on View

● WE LEARN that there is an old horse-drawn fire engine, believed to be a Shand Mason, on view to the public until June 23rd, in the Market Place at Burnley, Lancs. It is one of the "sights" arranged in connection with the local Festival of Britain celebrations, and it may be of much interest to readers who are able to visit Burnley not later than Saturday next.

The S.M.E.E. Affiliation

● WE HAVE received a copy of the annual report of the S.M.E.E. Affiliation, and we are pleased to note that the membership now extends to 51 societies, including five overseas. This shows that more societies are realising the benefits that can arise out of joining the Affiliation.

The report shows that good work has been done during the past twelve months. Tests in connection with the issue of official certificates to drivers of miniature locomotives have resulted in 27 certificates being issued. Information on commercial matters and sources of the supply of materials and workshop equipment is still being collected; when it is complete, it will be collated and circulated to all member societies.

We are especially pleased to note that, during the past year, many more societies have taken active interest in, and made use of the facilities offered by the Affiliation, and we endorse the expressed hope that this tendency will continue and increase. The test bench equipment at the S.M.E.E. headquarters provides means for testing steam and i.c. engines as well as electrical machines and apparatus. This should prove invaluable in helping to collect technical information as to the performance of steam locomotives and almost any other form of engine or prime mover in miniature.

Societies wishing to join the Affiliation should communicate with Mr. J. W. Reed, 60, Ennerdale Drive, London, N.W.9, who will be glad to supply all necessary information.

Our Hobby Helps

● A CHESHIRE reader, Mr. A. Wilby, recently wrote us an interesting letter which began by thanking us for a small service we had been able to render him; he then expressed his appreciation of the good work which our contributors and staff are putting into THE MODEL ENGINEER.

We are taking the liberty of quoting a very interesting extract from this letter, because it may help others to appreciate some of the benefits that model engineering can often bestow upon those who practice it. Mr. Wilby writes: "After 11 years of engineering, mainly on machine tool maintenance and tool-room work, I still find much of interest and fresh ideas both for full-size and model engineering. Even though I left the full-size job some four years ago, the workshop still keeps me in practise; for engineering is a dreadful disease which, once you get it, you cannot lose. But then, who wants to lose it?"

"Incidentally, modelling has helped me with my present job as a grocery salesman on a travelling shop. After a discussion with one of the heads of my firm, I designed what I considered a suitable vehicle and built a model of it. This was duly inspected at the head office and, later, put into the hands of the body-builders who used it as the basis for a travelling shop which I shall shortly be receiving to replace my present one."

Truly, one never knows where our hobby may lead! We have, of course, seen travelling shops in many parts of the country, and they always have seemed to be wonderfully compact and convenient; but we hope that our correspondent's

improvement may eventually become widely applied.

The Conditions will be Respected

● OUR "SMOKE RING" headed "Novel Conditions" in our May 17th issue has had a surprising sequel. Readers will recall that we referred to an advertisement offering a traction engine for sale on condition that it "must be preserved and not cut up." We have now been advised that the engine was sold to a new owner at Sowerby Bridge, Yorks, who has given an undertaking in writing to respect the condition of sale; he bought the engine for £45.

So our curiosity, as expressed in the last sentence of the paragraph referred to, is satisfied! And we think that many other readers will feel the same satisfaction.

Incidentally, this reminds us that, during a recent railway trip to Rugby, we happened to be looking out of the window of our coach and caught a fleeting glimpse of a traction engine apparently ploughing a field about 300 yards west of the London Midland Region main line between Weedon and Wilton, Northants. Owing to the speed of our train, this sight was gone in a flash; but, on the return trip later that day, we were deliberately watching for that engine, and we saw it again. This time it was not working, but was standing quietly with a faint wisp of smoke issuing from the chimney. Also, we were able to see that it was not ploughing but appeared to be engaged on the construction of a new road or track of some kind. Does any reader know anything about it?

Traction Engines in North London

● A RECENT letter from a Tottenham reader, Mr. R. E. Chapman, who explains that he is not a steam enthusiast himself but is always willing to pass on information that may be of interest to those who are, calls attention to two yards at the back of Woolworth's premises in the Tottenham High Road, London, N. Our correspondent states that these yards belong to an old steam enthusiast who seems to occupy himself in buying old traction and other steam engines, overhauling them and reselling them.

Recently, one of the yards for some weeks contained four traction engines, three of which were often in steam being driven about the yard. One was a Clayton, one a Tasker spring-mounted engine, the third apparently a large Fowler ploughing engine, while the fourth was too much dismantled to identify.

From the other yard, some familiar noises could be heard. Investigation revealed a fine portable engine, in excellent condition and newly painted, driving a circular saw and what our correspondent describes as a "Heath Robinson wood-chopping gadget." Apparently, this machine is at work from Mondays to Fridays; it is out in the open, obviously in good fettle and doing a useful job of work. We have not yet had an opportunity of visiting the Tottenham High Road to inspect these yards for ourselves; but there may be other enthusiasts who could manage it, and, to all appearances, they would be well rewarded.

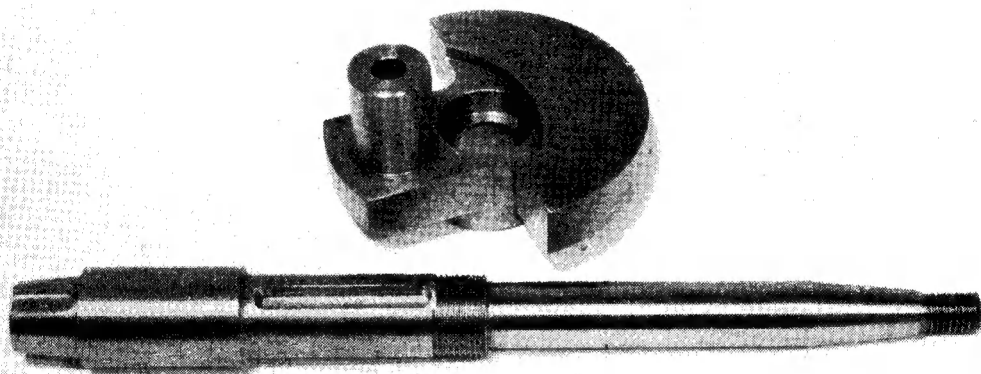
PETROL ENGINE TOPICS

* A 50-c.c. Auxiliary Engine

by Edgar T. Westbury

THE machining of the crankshaft journal is a fairly straightforward operation, which can be carried out between centres. At its largest point, the diameter of the finished shaft is $\frac{3}{8}$ in., so that it could comfortably be machined from a bar $\frac{13}{16}$ in. in diameter, though it is probable that the nearest available size will be $\frac{1}{2}$ in. Both ends of the bar should be truly faced before centring, and as the material is too large to pass through the hollow mandrel, there will be a fairly considerable overhang from the chuck. It is desirable

right-handed knife tool. The length of the shaft is not critical, but any error should be plus rather than minus. In machining the outer diameters, it is advisable first to rough turn to within about $\frac{1}{32}$ in. of finished size, working with the small end towards the tailstock and covering as much of the length as can be dealt with, short of fouling the carrier. Although the shaft is fairly slender, it can be turned without the necessity to rig up a steady, provided that the tool is sharp and properly set.



Crank disc and shaft, completely machined and ready for assembly

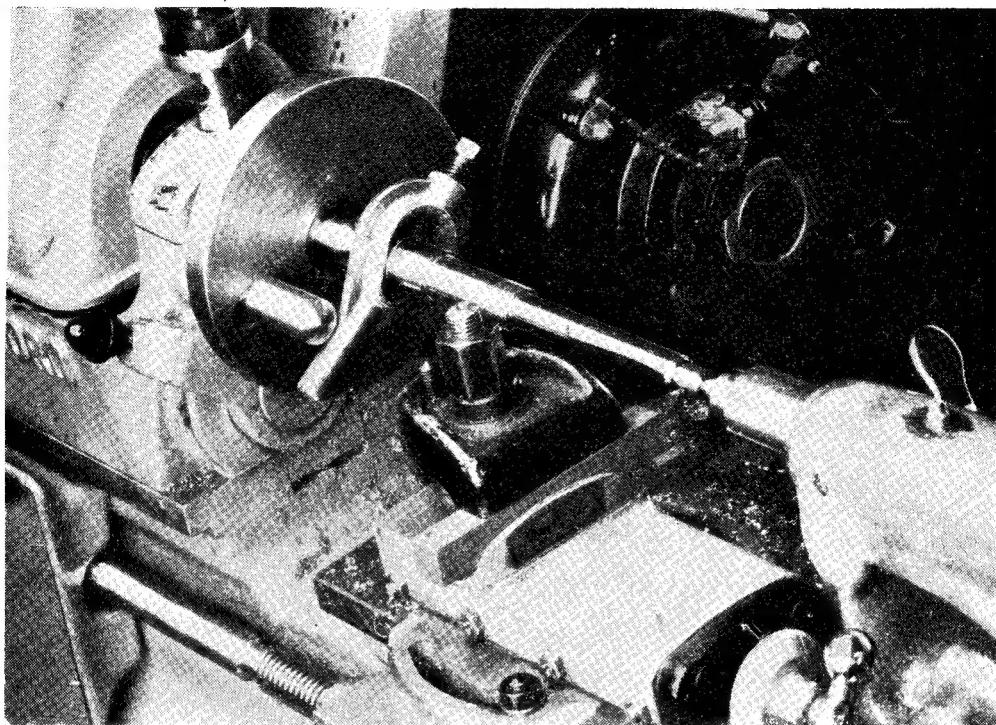
to support this in a fixed steady, if available, but failing this, an alternative method is to file the ends of the bar as squarely as possible, and mark out the centres with a bell punch or centre-finder, then drill each end in turn with a centre-drill held in the chuck, locating the other end on the back centre. The bar may be held in the hand firmly enough to resist drill torque, and feed applied from the tailstock. One of the centres—that at the crank web end—should be countersunk almost to the full depth, so that the centre is preserved after this end has been drilled and tapped for the $\frac{1}{4}$ in. retaining-screw, but the other centre should not be too deep, and the “pilot” of the drill should not be larger than $\frac{1}{16}$ in., as this end will only be $\frac{3}{8}$ in. dia. when finished.

If necessary, the ends of the bar may be faced after mounting between centres, by using a cut-away centre, which will allow of running in a

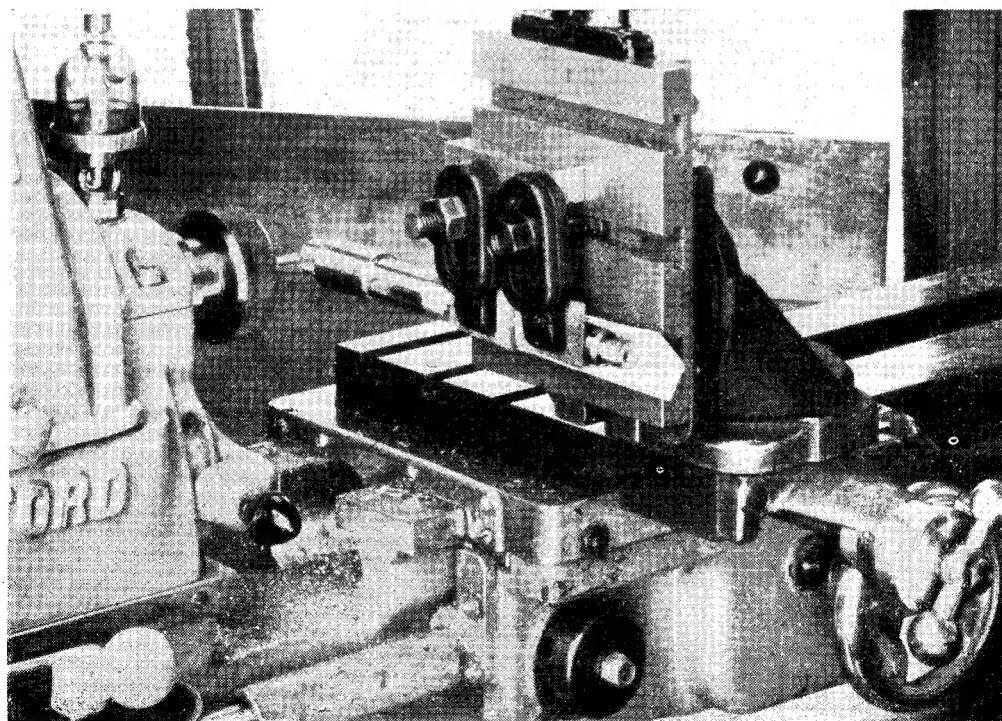
During the roughing operations, it is a good policy to check the surfaces for parallelism as the work proceeds. It is often found necessary to adjust the tailstock alignment, even when it has been set as truly as possible by preliminary tests, and as this may involve two or three trial cuts, it is obviously best to do this while there is plenty of material to play with. The Myford M.L.7 lathe has a set-over tailstock with adjusting screws front and back, but some types of lathes are less convenient and sometimes rather “chancy” to adjust; if no set-over movement is provided on the tailstock, it may be found necessary to improvise some arrangement, such as an eccentric back centre, to obtain this facility. It is necessary to ensure that the shaft is parallel, on its various steps, to fairly close limits—about 0.005 in. in the foot—and any error should be such that the diameters increase towards the crank disc end.

After roughing the major length of the shaft it may be reversed to deal with the part not

*Continued from page 736, “M.E.” June 7, 1951.



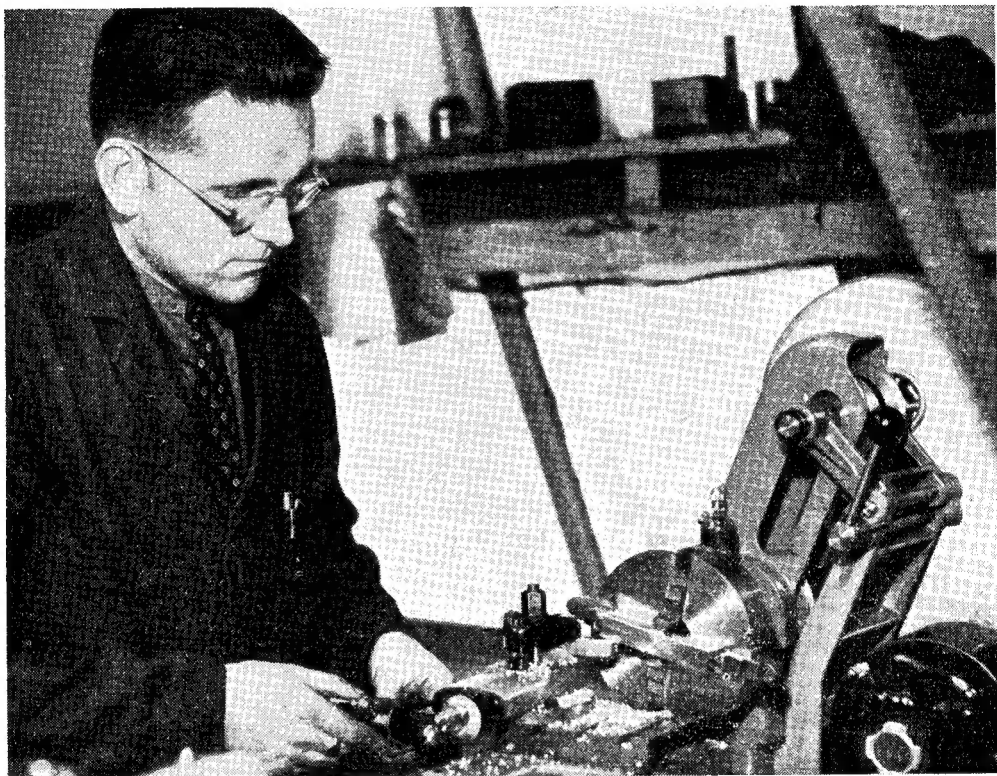
Screwcutting threads on crank journal



End-milling keyways in the crank journal

previously accessible, and this may be finished right out to size, except for the taper, which is most conveniently left to a later stage. A fine self-acting feed is desirable for finishing, and the tool should have about 10 to 15 deg. top rake, with a rounded tip, honed to a keen edge. The large diameter portion of the shaft should be a light press fit in the bore of the ball-race, that is about 0.0005 in. over $\frac{1}{8}$ in. dia. and it is permissible to use a dead smooth Swiss file and emery-cloth

by trial, in the bores of the crank disc and magneto respectively, and tested with "mechanics' blue" or similar marking colour. Here again, it is permissible to use a Swiss file for final fitting, but do not attempt to correct errors by lapping the mating parts together. Correct fitting of the tapers is most essential for the success of the job, but failures in this respect, due to lack of care and patience are very often encountered, and the remedy is obvious.



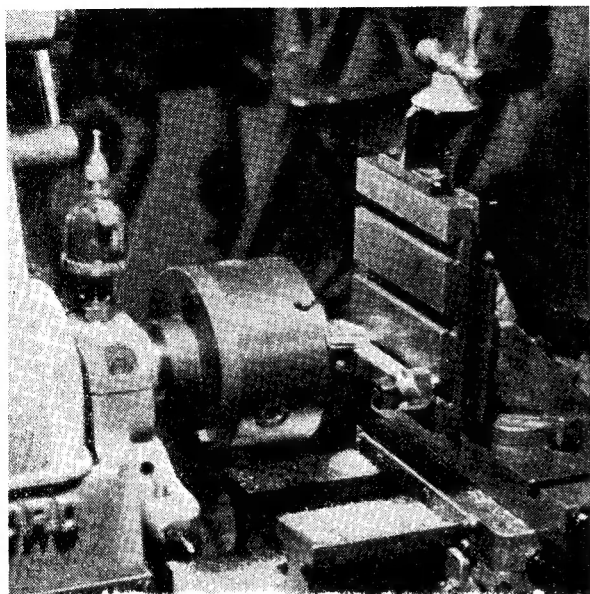
First stage in machining connecting-rod from solid bar

for final fitting, though the use of a fine oilstone slip is better, especially as a part of this length runs in the packing bush. Lapping with a ring lap is better still; the same applies to the other diameters of the shaft, which are, of course, finish-turned after replacing it in the original position. Incidentally, great care must be taken to see that the live centre in the mandrel socket runs perfectly true, and if not, the cause must be found, and due correction made before the finishing cuts are taken.

When turning the tapers on each end, it will be found advisable to swivel the lathe top-slide almost completely round, so that the handle is towards the headstock, as this avoids the need for excessive overhang of the tool or uncomfortable proximity of the handle to the tailstock. The angles at each end are, at least nominally, identical, but they should be individually fitted

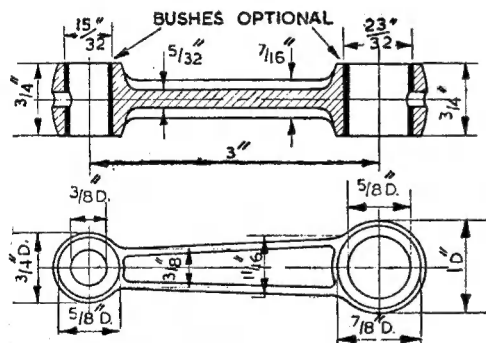
Screwcutting is called for on two diameters of the shaft, and this calls for little comment, as the necessary operations have been described on several occasions in *THE MODEL ENGINEER*. The pitch of the thread on the $\frac{1}{8}$ in. diameter portion is standard brass pipe thread, but it is unlikely that a suitable steel nut for this thread will be available ready made, and it will have to be produced. Note that the outside of this nut must be small enough to enable it to be manipulated by a tubular box spanner in the recess of the friction roller; the size is as for $\frac{1}{16}$ in. Whitworth nuts, and the thickness of the nut is $\frac{1}{4}$ in.

The shaft may be held in the chuck, with the small end passing into the hollow mandrel, and a strip of soft metal wrapped around the large diameter to protect it from marking by the chuck jaws, for drilling the tapping hole in the end, which is $\frac{1}{8}$ in. deep and tapped $\frac{1}{8}$ in. B.S.F. A



Milling the outside contour of connecting-rod

high-tensile set-screw, with a standard hexagon head and a thick washer $\frac{3}{8}$ in. outside diameter is recommended here, an alternative being a socket-head Allen type screw, and a counter-bored bush. In either case the fit of the screw in the thread must be good, and the use of some form of keep, such as a shakeproof or single-turn



⑥ CONNECTING-ROD - IOFF
MATERIAL DURALUMIN

spring washer, is desirable on final assembly. Note that the screw head must not project beyond the front face of the balance weight.

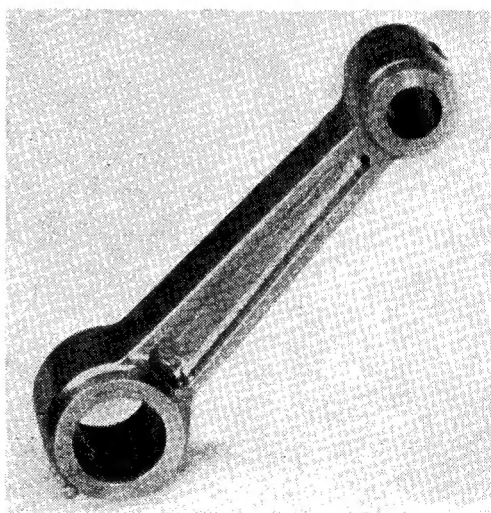
Cutting Keyways

This operation may be conveniently carried out by end-milling, and the photograph shows the shaft mounted on the Myford vertical slide, with due precautions for protecting the finished surface, by the use of slips of soft metal behind

the shaft and under the toes of the clamps. The cutter is held in a Myford collet chuck, but could be held in the three-jaw chuck if the latter is reasonably true; any error in this respect results in cutting over-width, and much less efficiently. The work must be set exactly horizontal, and may be checked by means of a scribing block on the ways of the bed, and the slide adjusted so that the height of the shaft axis is identical with that of the cutter axis, by the same means. Run the cross-slide as far as it will go in one direction to check on the centre at one end of the shaft, and then to the extreme position in the other direction for checking the other centre. Both keyways can then be cut at one setting. If no vertical slide is available, it would be possible to carry out the operation by using a vee-block clamped at the correct height on the vertical side of an angle-plate mounted on the cross-slide.

Connecting-rod

The connecting-rod used in the first "Busy Bee" engine was machined from the solid, and to those who are prepared to take the required



A connecting-rod machined from the solid

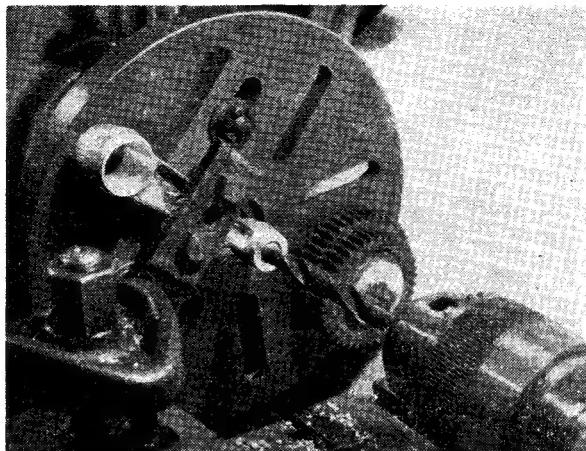
amount of trouble, and have suitable material available, this method will produce a rod having maximum strength in relation to weight. But many constructors find this a rather tedious operation, and as it is not economically possible to provide a forging for the component, experiments have been made with rods cast in bronze and aluminium alloy, with success in each case. The bronze rod provides considerable strength, and does not require bushing, but has the disadvantage

of somewhat excessive weight, though this can be counteracted to some extent by reducing the section all over. However, when all reasonably practicable work has been done in this direction, it is still too heavy to enable the engine to be balanced as well as it might be.

The light alloy casting eliminates this objection, and although a good deal lower in mechanical strength, it has been proved adequate under test.

In this case it is desirable to bush both the eyes to obtain the maximum length of wear, but rods machined all over from duralumin or similar high-tensile alloy give excellent wear without bushing. I do not propose to deal in detail with making the rod from the solid, as it has been described on several previous occasions, but the photographs give a fairly clear explanation of two of the operations, namely, the shaping of the rectangular blank (which started, in the first place, as round bar) and milling over the outside edges of the rod, after the eyes were bored and the sides reduced to the required thickness by facing about the eye centres.

The amount of machining called for on the cast rod is quite small, consisting only of boring and facing each of the eyes and skimming the accessible portions of the bosses. It will be seen that the rod is mounted for boring by a method which I have described in previous articles, namely, by clamping it to a flat bar which may be adjusted on the faceplate to bring each of the



Connecting-rod casting clamped to reversible plate and mounted on faceplate for machining the eyes

eyes in turn into the central position. It should be noted that the clamp securing the rod to the larger bar is not loosened between the two operations, the entire assembly being shifted end for end; this ensures that the two eyes are bound to be bored parallel with each other, even though the rough-cast surfaces of the webs which form the clamping faces may not be perfectly true.

It is, of course, necessary to see that the rod is reasonably parallel with the plate in the initial clamping up, and a slight dressing of the webs with a file may be found desirable. Side alignment of the eyes may be ensured by checking the distance of the front face from the faceplate, which should be the same for each end after machining. The outside of each boss should be machined, to a taper of about 15 deg. inclusive, as far as allowed by the webs. After removing from the clamp, the other side of each eye is faced to correct width, and the outside skimmed, by mounting the eyes on pin mandrels.

The edges of the bosses and webs may be filed for the sake of neatness, and to blend in the contour of the bosses to the machined parts so as to produce the barrel shape shown on the drawings. Bushes, if fitted, should be concentric inside and out and fitted to 0.001 in. interference, the oil holes being drilled after they have been inserted.

(To be continued)

The Reading S.M.E.E. Exhibition

THE first exhibition staged by the society in Palmer Hall, Reading, was a great success, approximately 4,000 people visiting the exhibition during the three days. The opening ceremony by the president, Lord Northesk, and the vice-president, Mr. J. N. Maskelyne, was filmed and added to the club film. There were about 200 models of all classes, several excellent models being loaned by the Andover and District M.E.S. Among the working models was a

miniature theatre, giving short stage and screen shows, "O" and "OO" railways and about 20 models were run on air. Ship models were of a very high standard and included a 6 ft. working model of H.M.S. *Hood* and a wireless-controlled tug. During the exhibition J.T.'s wandering microphone recorded visitors' remarks and played back through the hall speaker. The club workshop was the centre of interest, various jobs for the club's passenger track being performed.

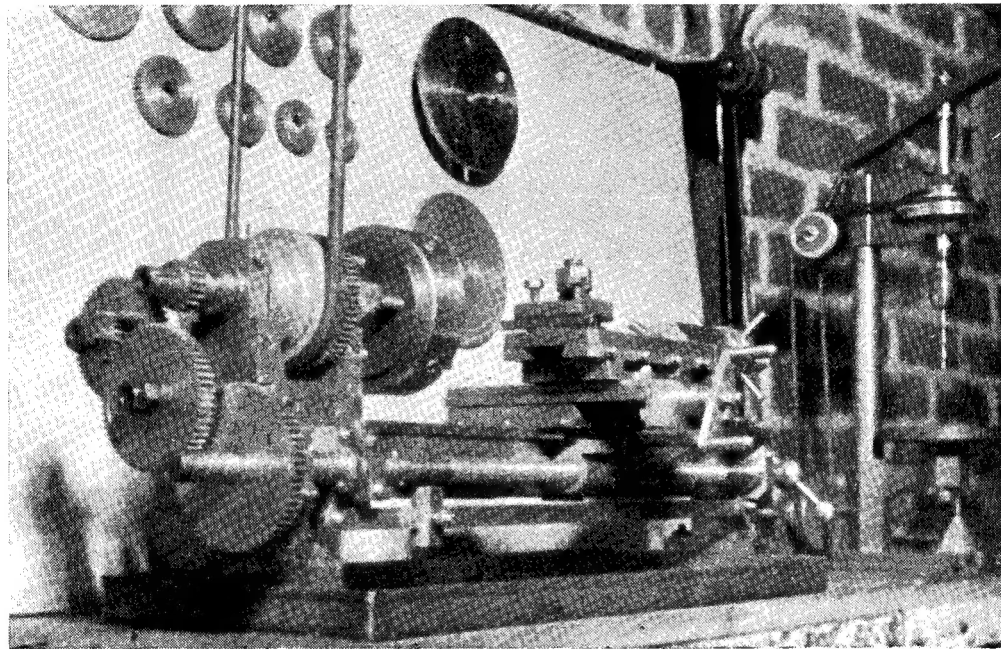
*A Hand-Made Lathe

by W. A. Clifford

HAVING got so far, my supply of steel of a suitable size for the tailstock ran out, and, to add to my difficulties, no one with whom I was acquainted seemed keen on making a lead-screw; so there, for the moment, I had to give it a rest. Being very anxious, however, to do something on the "contraption," I began to look around. It was while browsing through some

tion in a professional contortionist. The result of my agonies can be seen in one of the photographs.

The urge to "make something on the lathe" being satisfied, and suitable materials having come to hand, the tailstock was begun and completed. In order to bore the barrel, it was substituted for the mandrel and drilled $\frac{3}{8}$ in.



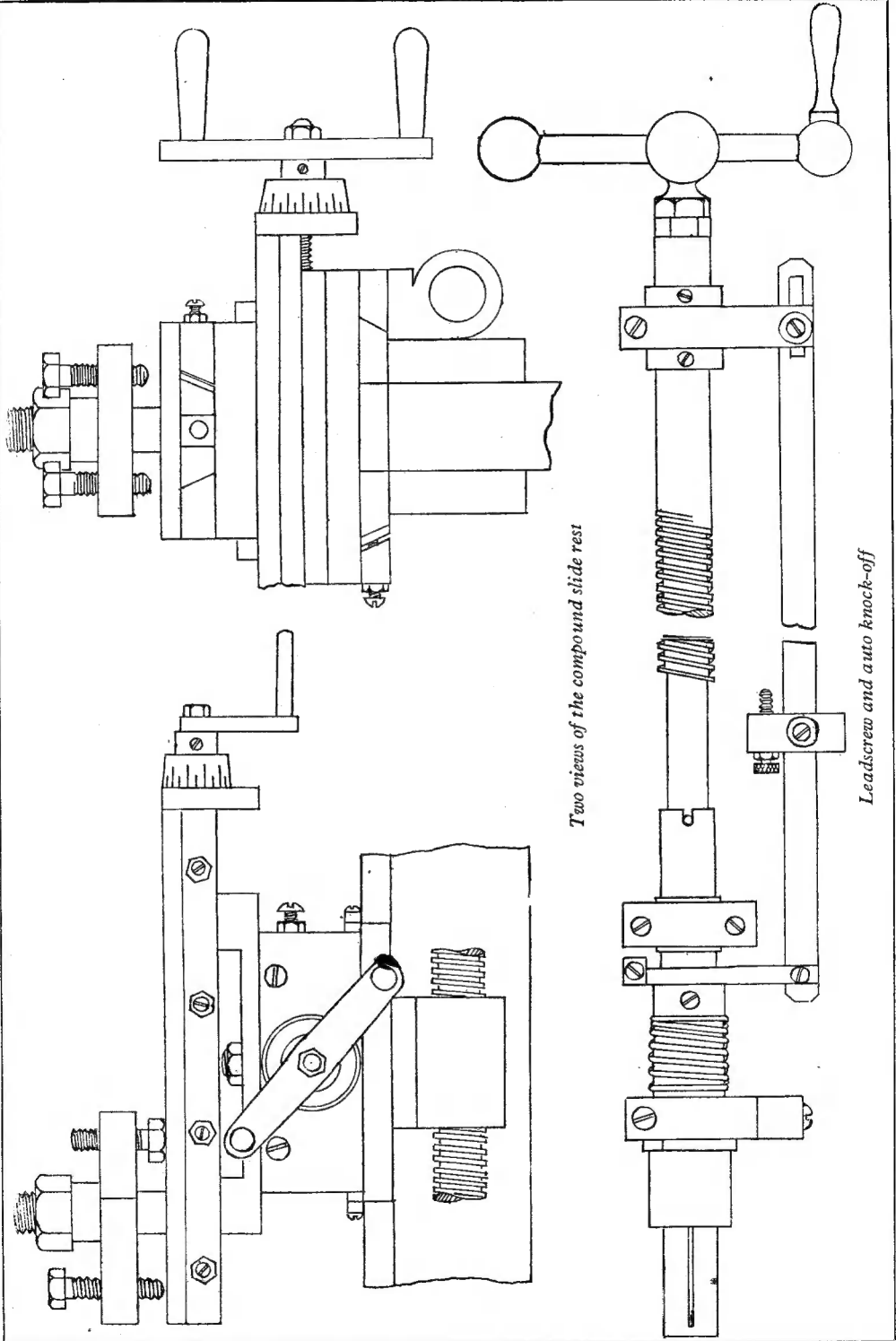
Another view of the lathe, showing the drilling machine, mentioned in the test, on the right

old copies of THE MODEL ENGINEER that I spotted the sensitive drill; a machine which, I believe, met with great success. This, to my enthusiastic heart, seemed to be the very thing, though my enthusiasm might have waned somewhat had I stopped to consider the difficulties. Castings were unobtainable, and my only machine tool, if I may call it such, was the partly completed lathe. Nevertheless, a search began for materials with which to fabricate a drill, and having found them, a start was made. I shall not dwell upon its fashioning; it was too painful. The scheming necessary for its production under the circumstances would have caused many a Chinese lawyer to groan, while the physical juggling would have induced a permanent osteopathic deforma-

clear. This operation was performed with a drill held in a special holder in the toolpost, the same appliance being used to drill the mandrel itself.

Thus, I had now completed the bed, headstock, compound rest, and tailstock. So far, so good—but there still remained the riddle of the lead-screw to solve. The answer was not far away, about a mile, to be precise, says Pat (sorry "L.B.S.C."). The answer took shape in the form of an old Pittler lathe, so ancient that I at once mentally dubbed it, "Great Gran'pa!" Old it was, but still a game bird when it came to a bit of screwcutting, and in no time, as the saying goes, the leadscrew, together with the nut, was produced. The brackets carrying the leadscrew are bronze bushed. The spring responsible for the loading of the auto-knock off is one half of a valve spring salvaged from an

*Continued from page 768, "M.E.," June 14, 1951.



Two views of the compound slide rest

Lead screw and auto knock-off

i.c. engine of unknown origin. After the handle and various small gadgets were fitted, there remained what proved to be the greatest task of all, the production of the back gears and change wheels. By way of preparation I purchased a large packet of hacksaw blades, some small files, a brass bar $3\frac{1}{2}$ in. in diameter, and a bottle of embrocation. Even now, after the healing touch of time, I still perspire slightly at the memory of cutting off the discs from that bar. However, they were finished, and today, I point with pride, (assuming there are no professional gear cutters present) to a nice assortment of wheels ranging from 20 to 65 teeth, all filed by hand, and to a deep depression in a concrete floor hollowed by the gentle drip of perspiration.

The swing-plate, or banjo, needs little comment, consisting as it does of a steel strip screwed to a split lug which swivels around a 1-in. P.B. bush, which, in its turn, is fixed into the first bracket on the bed. The swing arm is locked in the required position by a bolt which passes through the split lug and pinches it on to the bush.

The bushes which carry the change wheels are steel, and the key-ways were cut with a home-made cutter similar to the Woodruff type. This same cutter was used for cutting of the key-way in the tailstock barrel.

It may be of interest to those who prefer to make their own tools to know that the cutter

was made from an old flat file. The file was first well annealed, then the blank turned up and the teeth carefully filed and backed off. After re-hardening and tempering, it was mounted on an arbour and held in the chuck, the work-piece being held in a weird and wonderful contrivance on the top-slide.

It may be noticed in the photographs that the shaft which carries the drive to the leadscrew appears to protrude quite a long way from its bearing. In fact, it does. When I made it, I had an idea for an independent slow drive for the leadscrew, but as yet have been unable to put the idea into practice.

By the time the lathe was completed, supplies of things dear to the heart of the model engineer started to become available again, and it was with relief that the treadle was dismantled and a nice new $\frac{1}{4}$ h.p. motor installed. Not that I despise the treadle, only the labour involved.

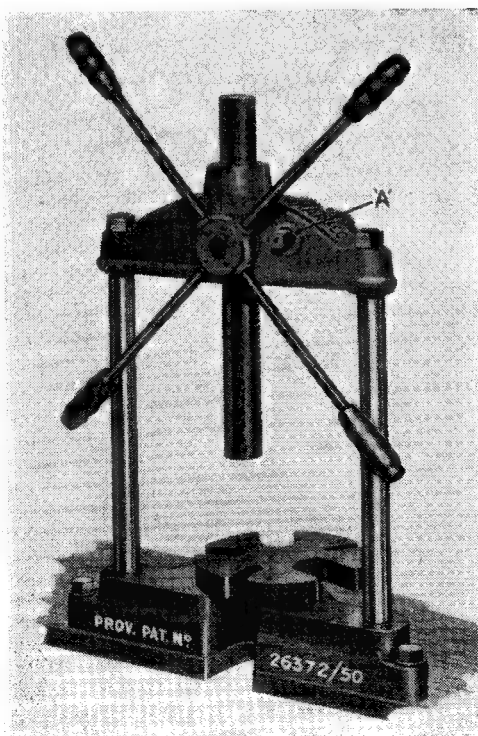
Since its completion, the lathe has been constantly used and has stood up to both use and, let me admit it, abuse. To those who for some reason or other cannot purchase a small lathe, I would sneak a phrase from a popular radio character and say, "Have a Go!" Any details which the drawings fail to make clear, I would be happy to forward to those sufficiently interested.

The photographs used with this article were taken by H. Millington.

"Marlco" Two-Speed Press

DESIGNED primarily for broaching with "Marlco" H.S.S. key-broaches, the two-speed press manufactured by W. H. Marley & Co. Ltd., 105 High Road, New Southgate, London, N.11, with its choice of two reductions is ideally suitable for a variety of workshop uses.

Low reduction of 16-1 is obtained by mounting the hand-wheel as shown in the illustration. This results in a direct drive to ram. By transferring the hand-wheel to the spindle marked "A," an additional reduction gear is introduced, and this results in a total reduction of 50-1. The hand-wheel is locked on the appropriate spindle by the lock-screw provided.



The design lends itself to continuous motion, a feature which is particularly advantageous where broaching operations are being conducted, and, as pressure can be supplied with both hands, a continuous resultant force in the region of 3,000 lb., on the ram can be maintained throughout the stroke.

The gravity force of the ram is overcome by an adjustable friction pad at the back of the top casting. This holds the ram in any position, which is an obvious asset when operating on a short stroke.

Further details and price may be obtained on application to the manufacturers, at the address which is given above.

AN INTERESTING OLD MODEL STEAM ENGINE

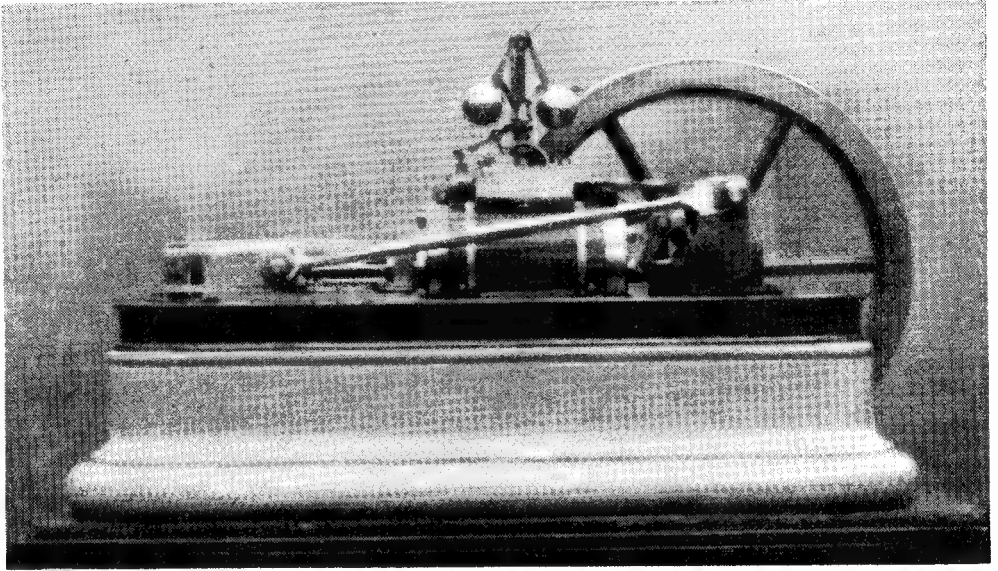
by F. P. Lewis

THE writer was on his way to the Motor Show at Earls Court (not with any hope of obtaining a new car "model," be it said), when the window of a curiosity shop quite near the exhibition main entrance, attracted his attention.

The goods displayed therein were obviously

saying: "This goes with the thing, and you may as well have the lot." Luck was certainly in!

Several happy months have been spent in cleaning and renovating this steam engine, and a description may be of interest to fellow steam engine admirers or model makers.



Side view of engine, showing one of the handsome connecting-rods and the governor toggle gear

of a better class than usual, but the only object of real interest, from a model engineer's viewpoint, was a dirty, rather rusty, old-time model steam engine which appeared to be of unusual pattern. It was surrounded by smart cameras, vacuum cleaners, electric irons, etc., and looked very forlorn.

The inherent love of the model maker compelled the writer to enter the shop, enquire the price and examine it at closer quarters. The engine seemed very well finished under its coat of dirt, but alas! The price asked was beyond his limited pocket.

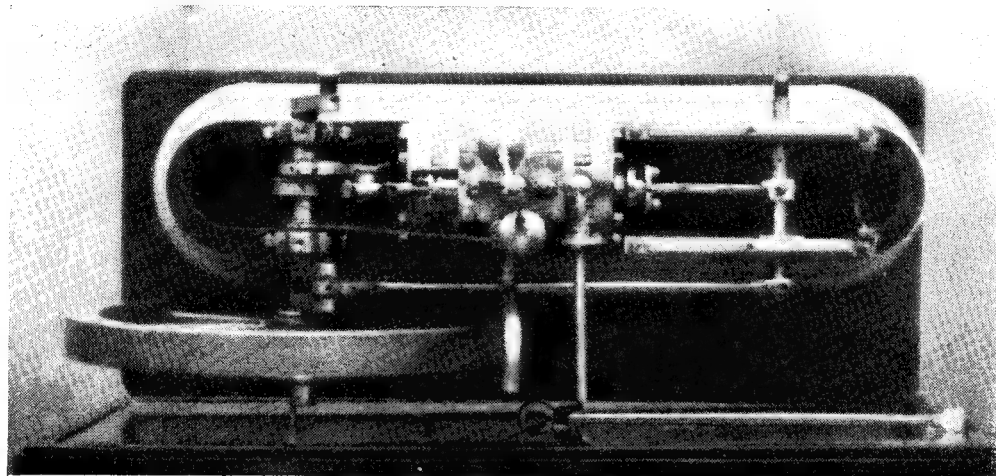
Quite unexpectedly, some weeks later, a business trip meant driving past the shop again and the opportunity was taken of looking therein to see if the model was unsold. It was still there, possibly a little more rusty and dirty, and so the more appealing. Once more the shopkeeper was approached and after some friendly argument, he suddenly relented and halved the original price asked. This was immediately accepted, and the man thereupon disappeared at the rear of the shop where he could be heard rummaging around. A few minutes later he reappeared carrying a very dusty, but neatly made glass case,

The central position of the cylinder and "lay out" of the motion work, of a type quite strange to the writer, bears the stamp of an engineer, and the finish that of a real craftsman.

The bed, originally varnished, was of solid oak made up from three pieces, the rounded ends being dowelled to the centre block, the whole being very well carved as regards mouldings and "flared" bottom. On this bed a baseplate was secured by four screws. The sides of the plate consisted of an "I" section iron casting, 15 in. long by 3 in. width by 1 in. depth with oval ends, all in one piece. On the underside of this was flush-riveted a flat steel plate 3/32 in. thick. So well was this done that only very careful inspection when the engine was stripped showed that the whole baseplate was not a single casting. This plate, which bore traces of blue paint, was left rough on the top surface to simulate the prototype casting. The steam cylinder was an iron casting with covers of the same material, bore 2 in., stroke 3 in. It was unlagged and painted in blue. End covers were fastened by hand-made cheese-headed screws, there being only six per cover, with very large heads and crude slots. End covers were unduly thick, and piston-rod

gland circular and very massive. The valve-chest, placed on top of the cylinder, had a crude hexagonal gland-nut for the valve-rod, but a neat cover fastened by the only studs and hexagonal nuts on the engine. Screwed to this cover was a neatly made bridge-shaped bracket, supporting the governor. This was a tremendously massive looking job, but most perfectly finished, with all parts hand filed from the solid. The various

would appear to be the main reason for its construction. Secondly, the slide-valve could be easily driven by a direct lever and toggle from the crankshaft to the valve-rod which entered the chest from the opposite end to normal—at the rear of the chest. Thirdly, this method of using two widely-spaced connecting-rods and cranks working together and sharing the push and pull of the piston-rod meant an exceptionally smooth-



A plan view, showing the short length required by this layout. One connecting-rod and water pump removed

joints were all forked and accurately pinned together, whilst the top links of the "diamond" were in one piece with the $\frac{3}{4}$ in. diameter steel balls. They must have taken many hours of patient filing. An ingenious system of links and toggles connected the governor to a butterfly throttle control housed in a cast brass elbow, threaded into the front end of the steam-chest. This elbow also carried the main steam pipe of $\frac{1}{2}$ -in. copper pipe with an ugly union fitting at the outer end for boiler attachment. Part of the toggle gear was broken and part missing. The exhaust pipe, $\frac{3}{4}$ in. diameter, also had a crude union fitting one end and both this and the steam pipe had cracked along part of their lengths and had been soft-soldered. Exhaust pipe was screwed direct into cylinder block just under the steam-chest. The cylinder had four cast-on lugs—one at each corner halfway up the flange diameter and these fitted snugly on the baseplate top, being fastened thereto by the inevitable cheese-head screws. The rather unorthodox position of the cylinder, halfway along the baseplate, allowed the constructor to place the slide bars at front of the cylinder—in the normal position—but the crankshaft at the rear thereof, coupling the piston-rod thereto by a crosshead and two very long connecting-rods fixed to a 6 in. long crossbar going through the crosshead. Crankshaft had three bearings, one being an "outrigger" type at the outer end of the crankshaft beyond the flywheel.

This novel layout first meant a considerable reduction in the overall length of the engine, and

running engine entirely free from all side stress or strain. Lastly, the engine when in motion was (and still is) a joy to watch, for all the moving parts are so clearly visible, especially the two 9-in. connecting-rods. These latter are real beauties, being bright hand-finished steel forgings with perfectly made strap-ended gibs, brasses and cotters at the crosshead ends and solid eyes with split brasses and adjustable circular cotterspines at the crankshaft. The crankshaft was turned from the solid throughout its 6 in. length, but the single crank furthest from the flywheel appeared to be shrunk on separately. This was done probably to simplify the fitting of the governor drive pulley, valve eccentric and water-pump, ditto, all of which were neatly turned in steel and correctly keyed to the shaft. The flywheel of cast-iron was, in one piece with 10 in. diameter rim $\frac{3}{4}$ in. wide, spokes circular, six in number, $\frac{3}{4}$ in. diameter and parallel so that they joined the hub and rim without any radius, giving a somewhat spindly effect to the wheel.

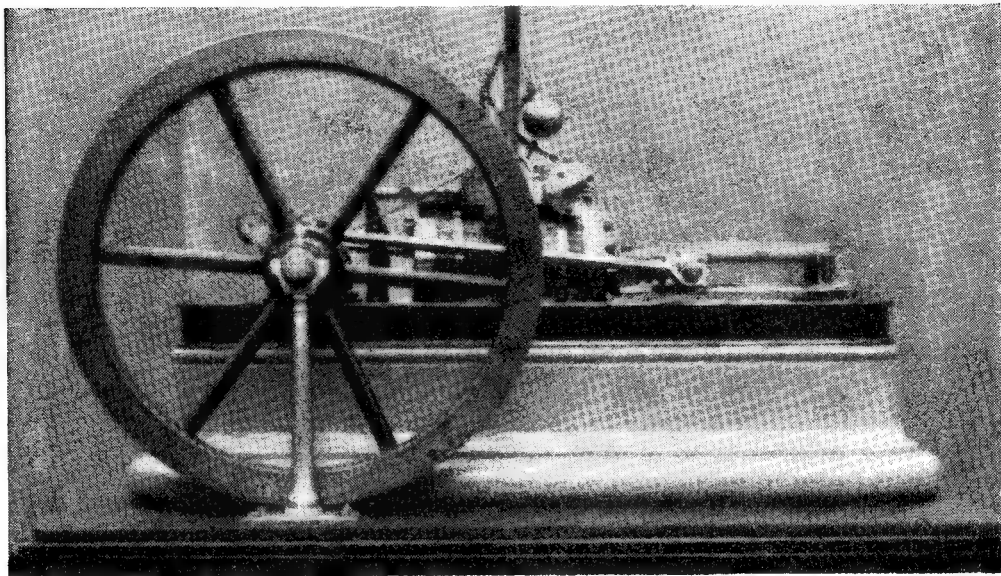
A very neat casting in the form of a moulded bracket was used to support the outer end of slide bars which were $\frac{1}{4}$ in. \times $\frac{3}{16}$ in. flat steel strips, the cylinder ends thereof having spacing lugs bolted direct to the end cover flange. The crosshead had two nicely turned arms of equal length cotted to the crosshead and piston-rod, the boss being of square section perfectly finished by hand.

Main bearings were lovely little cast-iron models fitted with detachable caps and split

brasses. The "outrigger" bearing was similar, but in brass and mounted on a handsome turned brass pillar built up on a 2 in. \times 1 in. rectangular baseplate, the bottom end of the pillar being finished square.

The water-pump, driven from an eccentric, was in brass, and made up from six turned sections all soft-soldered together. This unit

of old-time winding engines that appeared in the 1931-2 issues of *THE MODEL ENGINEER* and mill engines of the 19th century in an old catalogue, appeared to date the model from about 1860-80, though I could not find a single example of the actual layout of the motion work, etc. Taking these dates as a rough guide, certain alterations appeared proper.



Renovation complete except for water-pump. Note the brass "outrigger" bearing pillars, and the blow-holes in casting on the flywheel

was broken and dismantled when the engine was bought. It was normally located on a built-up angle bracket fitted on the baseplate top just behind the crankshaft.

Much thought was given to the renovation of this model before the actual work was commenced. My knowledge of old-time steam engines was very scanty, for I am a commercial traveller by trade, model work being a spare time (limited) hobby. There were several obvious faults in the model, yet basically almost every part showed a faultless finish. It appeared to me that the maker had deliberately "over-scaled" (if one may use such a term) all the moving parts, so as to emphasise the novelty of the design. If this was so, he has certainly succeeded, for I have seldom seen a working model look so attractive when in motion. The very massiveness of the rotating parts gives an impression of tremendous power and strength, and I felt that to destroy so much old-time craftsmanship by correct scaling would be veritable sabotage.

Much midnight oil was burned reading back numbers of *THE MODEL ENGINEER* and old-time steam engine literature. This was done to obtain guidance as to what to alter or renovate, for it is fatally easy for the amateur to spoil a good model by incorrect details. Illustrations

Some 60 odd cheese-head screws were removed and replaced with correct type studs and hexagonal steel nuts. This work was not so easy as might be imagined, for the threads of the old-time screws, though of Whitworth form, were of extraordinary varied diameter. This meant that many of the replacements had to be hand-chased in the lathe, as I had no dies suitable. All old-time cylinders appeared to have considerably more than six end cover studs, so these were increased to 12 per cover by careful spacing. End covers were thinned down on the joint side to avoid destroying the original turning on the exterior and a new two-stud gland fitting made up. All this made considerable improvement to the model's appearance. The cylinder was lagged with narrow mahogany strips—a most tedious job, as they had to be very thin to avoid some ribs cast on the cylinder diameter about $\frac{1}{8}$ in. from each end. A raised rib tapering from centre to ends was added to each top-slide bar to simulate current old-time practice where cast-steel bars were used. The original very large oil cups for these bars were carefully reduced in the lathe to nearly half the former size and then re-used.

Governor toggle gear was rebuilt, and missing parts replaced so that it would work as intended.

(Continued on page 800)

Welling Model Engineers' Festival Regatta



Mr. A. Rayman (Blackheath) preparing to stop "Yvonne" on a return run

THIS was the first venture of its kind by the Welling Society, who only became members of the M.P.B.A. this year. As a first effort, to say it was a success would be an understatement. The Belvedere lake is set in a natural amphitheatre, and provided an ideal setting, marred only by the fact that there is a fountain in the centre of the lake.

The first event of the day was a nomination race, for which there were 14 entries and the results were:—

- 1st. *Darkey*, Mr. J. Jepson, Blackheath, 1.85 per cent. error.
- 2nd. *Rose*, Mr. J. Thomas, Blackheath, 1.97 per cent. error.
- 3rd. *Korongo*, Mr. F. Curtis, Kingsmere, 3.45 per cent. error.

The steering event followed the usual pattern, but it was someone's bright idea to substitute balloons for the target signs at the top of the stakes, and by the time the event had started they had all exploded due to the heat, causing much amusement to the spectators, and requiring some quick improvisation by the Welling works section. After this, things ran according to plan and Blackheath showed up again as victors, Mr. Rayman scoring a bull on each of his runs.

- 1st. *Yvonne*, A. Rayman, Blackheath, 15.
 - 2nd. *Squib II*, A. Gates, Victoria, 11.
 - 3rd. *Comet*, J. Benson, Blackheath, 9.
- Fourteen started.

For diversion, and as a challenge to the more hardy ones, a round-the-pond towing competition was held, and there were nine entries, of whom one failed to finish. They were required to tow themselves in a rubber dinghy, and it was

hoped that at least one would sink, but the spectators were disappointed.

Result :

- 1st. *Elizabeth*, A. Clay, Blackheath, 2 min. 12 sec.
- 2nd. *Comet*, J. Benson, Blackheath, 2 min. 28 sec.
- 3rd. *Barbara*, A. C. Clark, Welling, 2 min. 47 sec.

The team race, which was the next and best competitive item, was contested on a nomination basis, each team of three being required to run each boat up and down the lake once, and the total time of the team being nominated.

- 1st. Kingsmere, Messrs. Curtis, Duncan and Fastier, 6.8 per cent. error.
- 2nd. Blackheath, Messrs. Benson, Clay and Rayman, 11.1 per cent. error.
- 3rd. Victoria, Messrs. Varner, Gates and Thomas, 57.3 per cent. error.

Whilst these events were under way, Mr. Berry, of the Kent S.M.E., was undertaking a roving commission to decide which were the best-finished, built and looking boats on the lake, and on his observations he decided that the best steam boat was *Yvonne* by Mr. Rayman, Blackheath, and the best petrol boat *Rose*, by Mr. Thomas, of Blackheath, who respectively received first prizes.

The prizes were presented to the winners by Alderman E. Clark, Mayor of Erith, who was introduced by Mr. J. A. King, the Welling S.M.E. organiser.

From his remarks to each competitor, it was obvious that the Mayor had made a close study of each event.

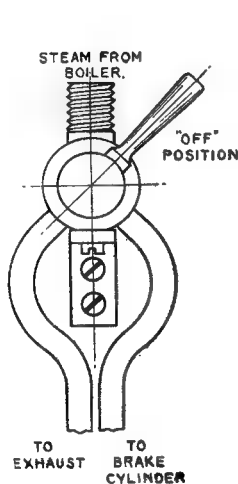
"PAMELA"

by "L.B.S.C."

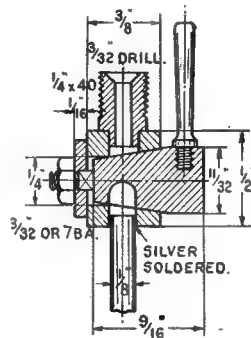
A 3½-in. Gauge Rebuild of ■ Southern Pacific

HAVING fitted the whole of the brake gear, all we need to complete the job is ■ brake valve for operating the steam brakes ; and here are the notes and illustrations for ■ very simple one. It consists of ■ three-way cock, the body of which is made from ■ ¾-in. length of ½-in. round bronze or gunmetal rod, parted off in the three jaw. See that both ends are faced truly, then centre, drill through with ¼-in. drill, and ream

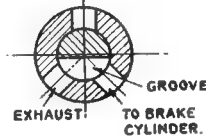
long enough to reach below the footplate. In the right-hand hole, fit another piece of tube, long enough to reach to the brake cylinder ; both these measurements ■ obtained from the actual engine, with ■ piece of lead wire, or soft copper wire, same ■ I always do on my own jobs. It saves making wrong measurements, and allows for all bends. Silver-solder all three joints ; pickle, wash off, clean up, and put the taper reamer



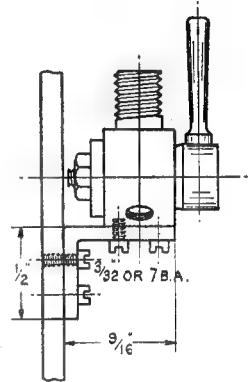
Driver's simple brake valve



Section through brake valve FROM BOILER



Cross section through brake valve plug



How to erect brake valve

with ■ taper reamer made from ¾-in. round silver-steel, by the same process ■ described for making the reamers for cylinder drain-cocks and injector. The exact angle of taper doesn't matter ; if you set your top-slide around to the same amount needed for the injector cone reamer with the ¾ in. taper (approximately 9 deg.) it will do, or you can "scale" the drawing. Don't forget, after turning the taper on the reamer, to turn ■ similar taper on the end of ■ piece of ¾-in. round rod, for the cock plug, without shifting the top slide, so that the plug will exactly fit the hole made by the reamer. Don't poke the reamer through too far, but leave about 1/16 in. of the hole at the smaller end parallel, ■ shown in the section. This allows for plug grinding. Mark off the holes for the pipes and union, ■ shown in the illustrations ; drill the pipe holes No. 32, and the union hole 5/32 in. In the latter, fit a ¼ in. x 40 union screw or nipple, made like those described for the boiler fittings. In the left-hand hole at the lower side, fit ■ length of ½-in. copper tube,

through again, to remove any burring, or distortion with the heat. File a flat at the bottom, between the pipes, to form ■ seating for the bracket.

How to Fit the Plug

Fitting ■ taper cock plug is a *pons asinorum* to many good folk—goodness only knows why, for there is nothing difficult about it—so here is ■ brief note on how to fit this one. Chuck the bit of rod on which you turned the taper, in the three-jaw, and if it doesn't run truly, put ■ bit of foil or paper between the offending jaw and the rod. Now put the body on the taper, and make ■ scratch around same at the place where it shows through. Turn down the end to ½ in. diameter, until you have passed the scratch by approximately 1/16 in. ; see sectional illustration. Further reduce the end, until you are within ■ bare ½ in. of the shoulder, to 3/32 in. dia.; screw it 3/32 in. or 7 B.A. and cut the end off at ½ in. from the shoulder. File the ½ in. plain part square. At

approximately $\frac{3}{8}$ in. from the shoulder, turn about $\frac{1}{4}$ in. of the rod to $11/32$ in. diameter, and part off at $\frac{3}{8}$ in. from the shoulder.

At $5/32$ in. from the shoulder, using $\frac{1}{8}$ in. rat-tail file, cut $\frac{1}{8}$ groove right across the plug, to almost half its thickness, and carefully scrape away any burring around the filed part, but be careful not to damage the taper. With this groove horizontal at the bottom of the plug, drill $\frac{1}{8}$ No. 48 hole in the parallel part of the plug at the large end, the hole being at $\frac{1}{4}$ angle of 45° , so that the handle will be in the position shown in the front view of the complete valve. Tap the hole $3/32$ in. or 7 B.A., and fit in it, a handle turned from $\frac{1}{8}$ bit of $\frac{3}{8}$ -in. rod, nickel-bronze (German silver) for preference. The usual shape of tapered handle is shown, but it won't affect the operation if you turn it to any pet shape you may fancy. Some prefer the "beer-engine" type of handle, being naturally thirsty souls!

To grind in the plug, either wet it and sprinkle $\frac{1}{2}$ few grains of pumice powder on it, or else smear it with $\frac{1}{2}$ scraping off your oilstone. Only $\frac{1}{2}$ very small amount of abrasive is required. Put it in place in the valve body, and give it a few twists back and forth, pressing in lightly. Don't force it, or you'll score both the plug and the bore, and it will never become steamtight in a dozen Dutch months, which the kiddies reckon to equal $\frac{1}{2}$ donkey's year. Take it out, and note if the whole of the contact surface presents a matt appearance; if so, O.K. If not, it requires a wee bit more grinding-in. When all serene, wash the plug and the valve body in paraffin, to remove all traces of the abrasive; rub a soft blacklead pencil over the plug, and give it a smear with cylinder oil. It will then work easily, yet be perfectly steamtight. Chuck a bit of $\frac{3}{8}$ -in. round rod in the three-jaw; face, centre, drill about $\frac{1}{8}$ in. down with No. 41 or $3/32$ -in. drill, and part off $\frac{1}{8}$ slice, a full $\frac{1}{8}$ in. thick. File the hole square, to fit the square on the plug; put it on, with the faced side next the valve body, and secure with a commercial brass nut. This should be a tight fit on the thread, so that the plug can be set to work easily, yet without fear of the nut slacking back "on its own." If desired, the screwed part might be left longer, and lock-nuts fitted.

Erection and Operation

The valve is attached to the backhead, in the position shown in the view of the footplate fittings, published some time ago. It is supported by $\frac{1}{2}$ simple bracket, bent up from a piece of $\frac{1}{2}$ in. \times $\frac{1}{8}$ in. brass strip, which is attached to both the valve and the backhead by $3/32$ -in. or 7-B.A. brass screws. The illustration showing the bracket erected, should need $\frac{1}{2}$ explaining. A union nut and cone is fixed to the longer pipe, which goes down through the footplate and is led along to the brake cylinder, to which it is connected. The shorter pipe can either be left hanging straight down, or led into the ashpan; the water-gauge blowdown pipe on the L.B. & S.C. Railway engines discharged into the ashpan. The union $\frac{1}{2}$ top of the valve is connected to the union $\frac{1}{2}$ the whistle turret, by a $\frac{1}{8}$ -in. pipe furnished with nuts and cones at both ends;

the connection is shown in the cab view referred to above.

To "plonk 'em on," $\frac{1}{2}$ the enginemmen would say, the handle is moved to the left, so that the groove in the plug establishes communication (rather "third programmish," that) between the steam entry and the pipe leading to the brake cylinder, allowing steam to enter same and apply the brakes. When the handle is moved back to the position shown, the groove connects the pipe with the entrance to the way out, letting the steam from the brake cylinder escape through the exhaust pipe, whilst the pull-off spring releases the brakes. Apart from the fact that the brakes are not of much use for stopping a heavy load, owing to the big discrepancy between the weight of the locomotive herself and the load she can pull, there is always $\frac{1}{2}$ "time lag" through condensation, same as in full-size practice. My old friend, Bill Irvin, once got his engine and sixty wagons past Hitchin down main home signal, through excessive condensation on a cold winter's day; and your humble servant could tell $\frac{1}{2}$ moving (literally) story of the sad fate of $\frac{1}{2}$ pair of level-crossing gates near Polegate, on $\frac{1}{2}$ November evening about fifty years ago. We certainly had $\frac{1}{2}$ smashing time!

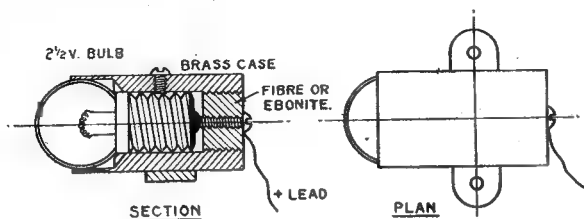
Electric Lighting

A full-sized railway doesn't stop running when "the shades of night are falling fast," as the old song begins; and there is no earthly reason why $\frac{1}{2}$ little one shouldn't "keep on keeping on" under similar conditions. Mine does, anyway; and a little locomotive buzzing along with its lights on, and the glow of the fire shining on the exhaust steam, is $\frac{1}{2}$ really pretty sight to anybody who loves them, same as I do. There is also on my road, the added attraction of the scintillating emeralds and rubies on the signal posts. Here is $\frac{1}{2}$ simple way to get "Milly Δ mp" to do the needful in the way of illumination. Ordinary 2.5-volt torch bulbs may be used; if you care to take the trouble, small dental and surgical lamps (much smaller than torch bulbs) may be pressed into service, and the lamps made practically "scale" size. Torch bulbs vary in size, some have big globes and some have little ones; the smaller the better for our purpose.

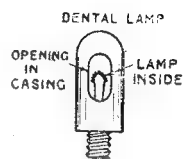
The body of the lamp merely consists of a bit of brass rod drilled to take the screwed part of the lamp, and countersunk to let the globe sink in about halfway, as shown in the section. A set-screw will hold it; there is no need to form a screw in the socket. The end of the lamp body is tapped, to take $\frac{1}{2}$ fibre or ebonite plug, in the middle of which is $\frac{1}{2}$ $3/32$ -in. brass screw, which serves the double purpose of a lamp contact and terminal for the positive lead. The return current goes through the metalwork of the engine. A flat piece of brass is soldered to the lamp body, rounded at the ends, and attached to the running-board, or smokebox top, by $\frac{1}{2}$ couple of $\frac{1}{8}$ -in. or 10-B.A. screws.

A tiny switch can be made from $\frac{1}{2}$ disc of fibre or ebonite, about $\frac{3}{8}$ in. diameter. Two 10- or 12-B.A. brass screws make nobby contacts; and a fragment of springy brass, with a tiny handle attached, serves for a switch lever, the

whole doings being clearly shown in the illustration. This could be mounted on the front plate of the tender, near the brake handle, by a couple of similar screws, set clear of the switch lever; but holes would have to be drilled, to clear the nuts and the contact screws, so that they wouldn't touch the metal of the tender, and causes a short circuit. "Milly Amp" is the quickest thing on earth, but also the laziest—she always takes the shortest cut for home!



Electric classification or destination lamp



Gauge lamp

Plenty of "juice" could be supplied by two torch cells in series, under the tender. A couple of ordinary steel tool clips, or home-made clips made of springy brass, should be screwed to the underside of the soleplate. At the front end, a fairly stout brass bracket containing an insulating bush, with a contact-screw in the middle, would be needed; and at the rear end, a spring bracket, to keep the cells in contact, could be fitted as shown. The connecting jumper between engine and tender, is the last word in simplicity, viz. a bit of $\frac{1}{8}$ -in. tube for a socket, and a tiny split-pin, made from thin brass wire, as a plug. Note: this must hang clear of the engine metalwork when connected up, or covered with a rubber tube.

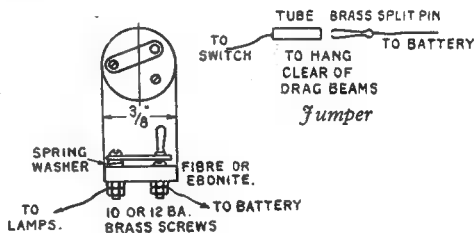
As to wiring, for the fixed wires it would be advisable to use enamelled wire, as is often used for dynamo and motor windings, as this stands up to heat, oil, and water without current leakage. For flexible connections, such as the wires leading to the jumper, fine silk-covered flex, as used in instrument work, would be the cat's whiskers. A diagram of the complete circuit is shown; it doesn't matter where the wires are run, as long as they commence and terminate at the right places. A lamp is usually fixed on the smokebox; the usual place is at the base of the chimney, but sometimes the bracket is on the door itself. My *Annabel* carries her big headlight on the door. In this case, it is difficult to hide up the positive wire; but it could be done by using very small tube for the handrails, instead of wire ($\frac{3}{32}$ -in. and $\frac{1}{16}$ -in. tube can be obtained commercially—I have some of each size here now) and a fine enamelled wire easily be threaded through the tube.

The most important thing, when running in darkness, is to see the water gauge; so it would be desirable to provide a "spotlight" for this, and it can easily be done. Dental and surgical lamps made in a variety of patterns, and I have one of the shape shown in the drawing. It is about $\frac{3}{4}$ in. long and $\frac{5}{32}$ in. diameter; I am going to fix it alongside *Grosvenor's* water gauge when opportunity arises. In the nickel-

plated casing, there is a small oval opening, through which the light from the lamp shines; and this only needs arranging, so that the ray of light illuminates the glass tube. The lamp can be attached to the backhead by a tiny bracket alongside the water gauge; and the enamelled wire, close to the backhead, going down through the footplate, would be practically invisible. In fact it can easily be hidden behind the injector steam pipe.

Epilogue

There is little more to add to the tale of *Pamela*, the ex-spam-can. Builders who are completing the job, will have a locomotive which, if reproduced in full size (as it probably will be—things like that have happened before!) would be far more efficient and economical, both in running and maintenance, than the original "air-smoothed" coal-eaters, and much more in keeping with the popular conception of express passenger engine, as far as appearances go. As to colours, British Railways will probably paint the rebuilds in a similar way to *Britannia* and her sisters, viz.: green, with black and orange lining, and black wheels and cylinders. This would be O.K. for the little one, except that it would look better with green wheels and cylinders;



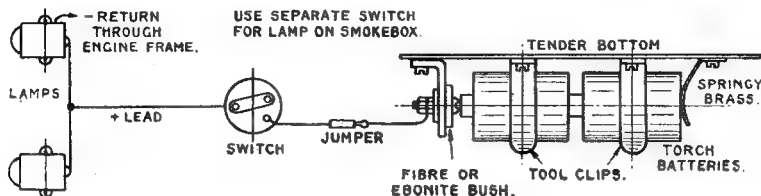
Simple switch

but at the same time I would advise builders to adopt their own colour scheme. Great Eastern blue would look fine; so would the old L.B. & S.C.R. umber, especially with black and gold lining. Many readers have asked for some notes on the correct way to paint and line a locomotive; the proper person to write those, would be Mr. Frank Cook, president of the Leeds club, who is a master signwriter, and a dab-hand at locomotive painting. What about it, brother?

Several readers have asked for details of *Pamela* in 5-in. gauge. The notes on the $\frac{3}{4}$ -in. gauge job could be taken as a general guide, increasing all dimensions in the proportion of

7 to 10; but the cross sections of the various rods and levers, especially in the motion work, should be very little heavier than in the $\frac{3}{4}$ -in. gauge engine. A specially-designed boiler would be needed; and if all goes well, and the K.B.P. doesn't use the said B.P., I will try to get out an arrangement of firebox, combustion-chamber, tubes, superheater, etc., that could be used in any 5-in. gauge 4-6-2 boiler. This should

capability of one individual; whilst the work involved in building it, would be beyond the full capacity of most home workshops. Unfortunately, enthusiasm completely runs away with many locomotive builders, or rather would-be builders, and they lightheartedly start in on a job without the least regard for what they are letting themselves in for. You should see the correspondence I have had from raw tyros who



Wiring diagram

satisfy the "worriers." At the same time, may I sound a note of warning. Followers of these notes badgered me non-stop for a 5-in. gauge design, until at last I got out the needful for the *Maid of Kent* and *Minx*, and scores of them were started; but alas! the very folk who had been the most enthusiastic to get a move on with an engine of this size, speedily found that it was too much of a handful for a home workshop. The number of *Maid* driving wheels, for example, that were turned as "homework" in various full-size engineering establishments throughout the country, would make certain folk sit up and take notice. *Pamela* in 5-in. gauge would be a real Tessie O'Shea, far too big and powerful for any suburban garden, and quite beyond the lifting

think they can build *Britannia* with the most meagre equipment, and no experience whatever! Whilst I appreciate the compliment that my instructions are clear enough for anybody to follow, they aren't the "be-all and end-all" of the job; the essentials are, a certain amount of equipment, and the ability to use it. It was to give these inexperienced workers the "lowdown" —as our transatlantic cousins call it—on locomotive building from A to Z, that I started the *Tich* serial, now nearing completion; and if all raw recruits built a *Tich* from the fully-detailed instructions, they would not only know what they were tackling in attempting a bigger engine, but would have the knowledge and experience needed for the job. 'Nuff sed!

An Interesting Old Model Steam Engine

(Continued from page 795)

I first decided to reduce the size of the steel balls, etc., but in finding they were in one piece with the arms, resolved to leave them as an example of the makers' patient work. A new bracket had to be made for a small pair of jockey wheels which guide the governor drive band. Special five-bolt flanges were added to the main steam pipe elbow, and exhaust outlet port, and short lengths of copper pipe were then bolted to these with duplicate flanges. These replaced the ugly union fittings previously employed.

The flywheel proved the biggest problem of all. Though nicely turned, it had a great number of blow holes on the outside of the rim just where they would show most of all, (some of these can be seen in the photograph). They were too deep to turn out, and after trying several London firms who specialise in iron castings to see if they could cast me a new one using this wheel as a pattern, and being told that for technical reasons this was not possible, I decided to use the wheel just as it stood, merely filling in the worst of the holes with solder and repainting the hub spokes.

So that the model could be set in motion by

means of compressed air, it was necessary to provide a rectangular "floor" 18 in. x 11 in. under the wooden bed upon which the outrigger pillar could be bolted. There was no evidence of any provision having been made originally to fix this pillar in relation to the bed. Fortunately, the glass case obtained with the model was just big enough to take this floor with the model permanently fixed thereto. The base-plate and various castings have been repainted in deep maroon and the bed block in stone colour to give the appearance of concrete. The light colour of the bed shows off the upper works to great advantage. With 10 lb. of air pressure the engine runs most engagingly, not too fast to spoil one's view of the motion work in detail and with the long "sigh and sob" that these old-timers, in full size, give vent to at slow speeds.

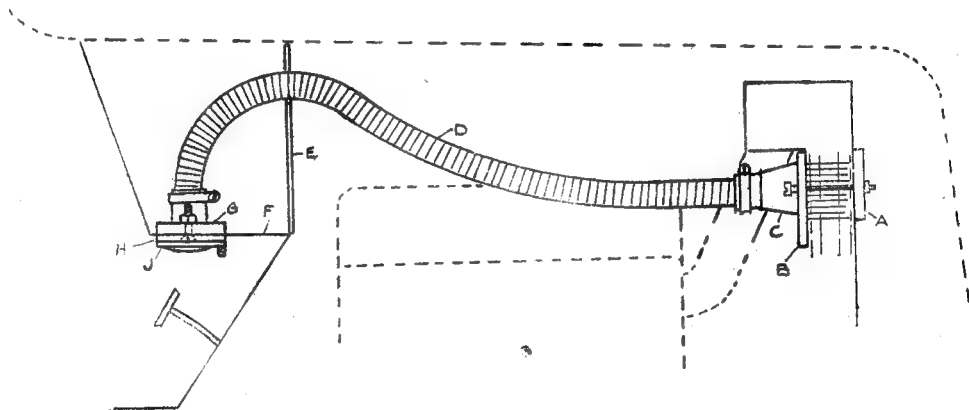
Concluding, the writer would welcome any news or comments on this engine. He feels sure that it must have a history. All the castings used were obviously made for this model alone, even to the cylinder with its cast-on lugs. It shows evidence of much use under steam, also.

A Car Heater for Ten Shillings

by T. J. Lewis

SOME readers would say that this attempt at describing the construction and fitting of a simple car-heating system has no business in THE MODEL ENGINEER. But surely there are plenty of model engineers and home mechanics who own a car and who stagger at the thought of buying any part or accessory if it can be made. Also, perhaps, this is not the best time of year for such a topic, but these particulars are passed on in the hope that some constructors may be

screws passing through the block. The rear baffle is fitted to a coned pipe C, and a length of flexible metal tubing D leads from this pipe through a slot cut in the bulkhead E passing into the driving compartment through a hole cut in the battery shelf F. The vent at this end consists of two flanges G and H, the latter, being inside the car, is provided with a simple shutter J. The ends of the flexible tubing are gripped in their respective fittings by making four saw-cuts



General arrangement of heater (not to scale)

encouraged to start operations ready for next winter.

Car heaters are comparatively new, which is surprising when one considers how much heat is wasted by the engine and all so badly needed inside the car on any winter journey. Hitherto, the poor driver suffered most, as he had to remain unhampered by rugs, etc., while the passengers could wrap up. Commercial heaters vary quite a lot in price, but even the cheapest is a fair outlay. This past cold winter and the thought of saving expense prodded me into a bout of experimenting. Success did not come at once, but I was determined not to do anything drastic, such as tapping the engine cooling system. Nothing could be simpler than the arrangement described here of tapping the heat from the radiator and avoiding any interference with the water circulation. The results on the first test were good and the final assembly proved almost more efficient than I had expected.

My car is a Morris Ten, Series M, and the drawing above shows the arrangement of the heater. It goes without saying that the layout can be varied to suit, and the sizes given in the drawings are only a guide. A and B are two baffle-plates clamped at the top of the radiator block as near as possible to the water outlet in the header. They are held in position by two long 7-B.A.

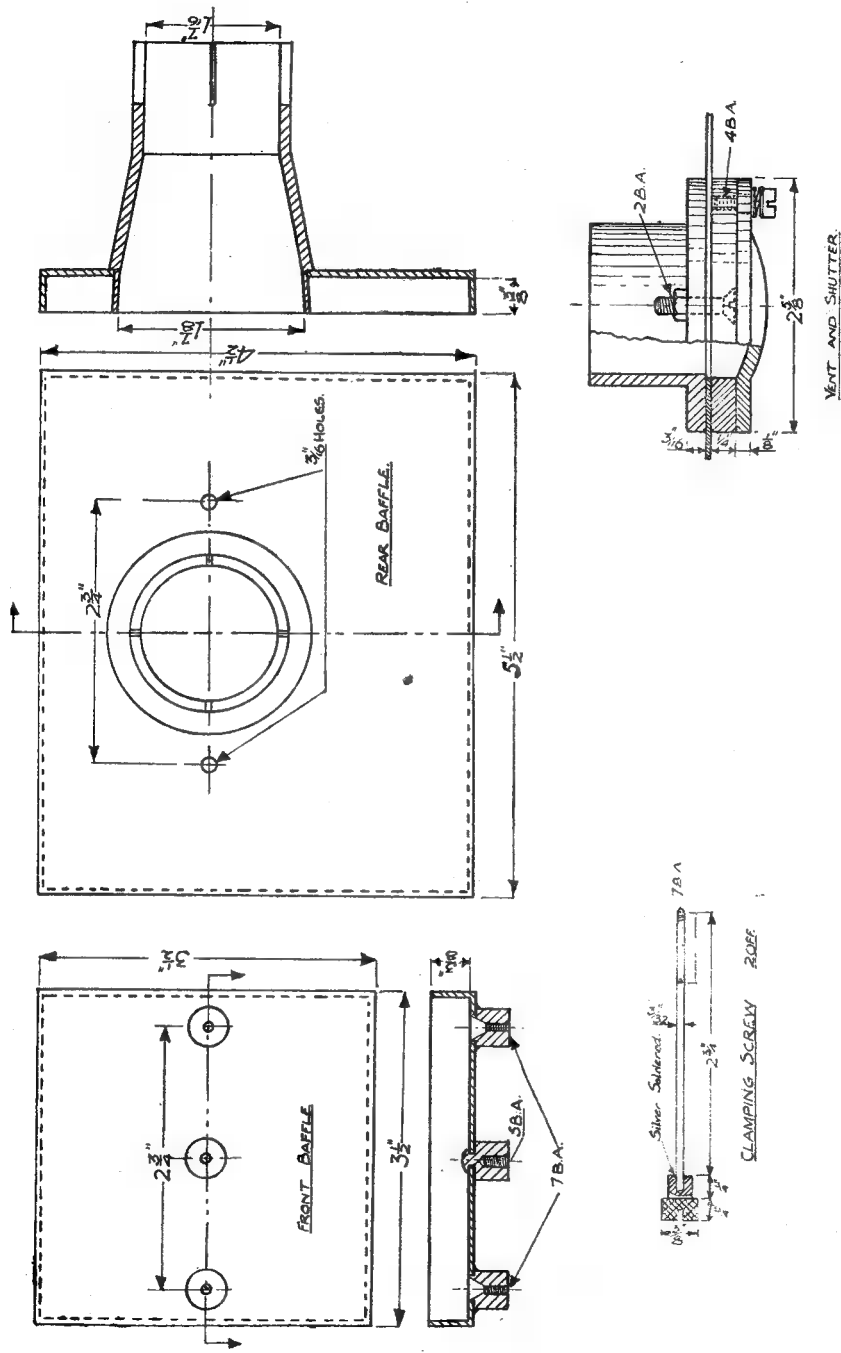
in the latter and using jubilee clips for contraction.

The action of this system is fairly obvious. The air passing through the radiator is denied a direct path into the tubing by the front baffle A but is trapped by the rear baffle B and made warm before spilling into the coned pipe and thence into the car. Note that the coned pipe in this rear baffle is extended right up to the radiator block, again with the idea of making the air circulate the honeycomb before passing into the tube. In use, the shutter is opened after the car has travelled a mile or so, by which time the radiator begins to warm up. Then, as long as the car is in motion, a much appreciated current of warm air enters near the driver's feet.

Here are some details to go with the drawings. Although I give sizes, I repeat that these are not important.

Front Baffle "A"

Made of 16-gauge brass sheet with edges bent over and corners soft-soldered. The metal was too thin for tapping for the clamping screws, so two small bosses tapped 7-B.A. thread were soft-soldered in position to provide the extra length of thread. The centre boss was blind drilled and tapped 5-B.A. thread. All three bosses were turned from $\frac{3}{8}$ in. diameter brass rod.



A length of $\frac{1}{8}$ in. diameter steel rod screwed into this centre boss is a great help in manoeuvring the front baffle into position due to space between the radiator grille and the radiator block.

Rear Baffle "B"

Again of 16-gauge brass, bent over and soldered as in A. The 2-in. hole was bored out in the lathe. The coned pipe was turned up from a simple casting of melted-down pistons. Plenty has been said about such castings, so I will avoid details here except to say that they are a great blessing for many a job.

The casting was first chucked at the large end and the smaller parallel portion turned on outside to finished size. This end was then gripped and the rest of the outside finished. When boring, a fair amount of metal was left in at the small end to ensure a good grip in the chuck. This was necessary, considering that the parallel portion the larger end was expanded in the 2-in. hole in the baffle-plate by a simple spinning process. When it is remembered that the baffle was in position when this spinning was being done, the whole job would soon be out of the chuck if the small-end bore had been finished to size.

Clamping-screws

Made of $\frac{3}{32}$ in. diameter mild-steel rod with large heads turned of brass silver-soldered on. It was found that the $\frac{3}{32}$ in. rod would just slide between the horizontal fins of the radiator, and 7 B.A. seemed about the right thread to use.

Flexible Tubing

Type which has a sealing of asbestos thread and generally used for exhaust systems. A

three-foot length was required in my case and it cost seven shillings. Its inside and outside diameters are approximately $1\frac{1}{8}$ in. and $1\frac{7}{16}$ in. respectively. Anything smaller would fail to pass a sufficient current of air, and I think one could go up to $1\frac{1}{2}$ in. inside diameter here. The tubes or ducts on the commercial heaters appear to be much larger, but I am wholly satisfied with things as they are.

Vent and Shutter

Flanges G and H, and shutter J were all turned up from another casting of piston metal. The flanges are bolted one on each side of the battery shelf by two 2-B.A. countersink bolts. The shutter swivels on a 4-B.A. hinge-pin which is fitted with a small double-coil spring washer to prevent the shutter moving on its own accord.

Fitting the heater to the car was easier than anticipated. The deep countersinks in the tapped bosses on the front baffle saved a lot of groping. The slot in the bulkhead took about fifteen minutes work with an Abrafile. The longest job was cutting the $1\frac{1}{8}$ in. diameter hole in the battery shelf. This is 18-gauge steel and the usual method of drilling a ring of holes and joining them by filing was used. The best drill I have found for this kind of work is an ordinary centre drill, as it penetrates the metal at a faster rate. I had to make an extension drill for this part of the job. A carbon-steel centre drill was silver-soldered into the end of a length of $\frac{3}{8}$ in. diameter steel rod and the point of the drill rehardened. Some washers and packing made of ordinary carpet underfelt were fitted between the vent flanges and the battery shelf, and where the tubing passes through the bulkhead.

Do not be tempted to use small-bore rubber tubing as a makeshift—it won't work.

For the Bookshelf

The East Coast Route, by George Dow, M.Inst.T., A.I.Loco.E. (London: The Locomotive Publishing Co. Ltd.) 64 pages, size $5\frac{1}{2}$ in. by $7\frac{1}{2}$ in. Price 7s. 6d. net.

This is an interesting history of one of the most important sections of railway in Britain, written by a recognised authority on the subject; for Mr. Dow is pre-eminently a railway enthusiast, in the widest sense of the term, and his professional duties have enabled him to collate an enormous amount of historical material which he has wisely decided to make available to the public.

The historical survey, strictly speaking, is confined to the first chapter, three which follow dealing with the principal features of the various sub-sections of line which together make up the

route from Kings Cross to Edinburgh and Aberdeen. The two concluding chapters cover locomotive and carriage development and describe some famous "East Coast" express trains.

The text is written in good plain English, even when describing such features as stations, bridges, tunnels and signals; it is enlivened, here and there, by anecdotes which fall quite naturally into the general narrative and there is not a dull page in the whole book.

The illustrations, 46 of which are halftones printed on art-paper inserts, supplemented by a few diagrams and maps in the text, are entirely appropriate; some of them are of great historical interest and have not seen the light of publicity for several decades, if ever before.

It is a book which should meet with much approval from all who value railway history.

Novices' Corner

Making a Grinding-Wheel Dresser

THE ordinary grinding wheel, used in the workshop for sharpening tools, is composed of grains of abrasive material, such as aluminium oxide, embedded in a bonding substance or matrix.

Although it is the abrasive material that serves to sharpen the tool, the matrix, nevertheless, plays an important part not only in holding the abrasive grains in place, but also in allowing them to be shed in the cutting action of the wheel falls off with the blunting of the individual

surface. A grinding wheel may, however, fail to cut freely because metal particles have become embedded in its surface; a wheel in this condition is said to be loaded or filled and, again, the remedy is to renew the surface with a wheel dresser.

The commercial form of wheel dresser is rather large and cumbersome for use on the grinding wheels of moderate size commonly found in the small workshop; in fact, the dresser illustrated in Fig. 1 measures nearly a foot in length, and the large head seriously limits the amount



Fig. 1. A commercial wheel-dresser

grains. This bonding material is specially compounded to vary over a wide range of hardness, but actually the degree of hardness or softness denotes the tenacity of the bond to hold the abrasive grains. Clearly then, a bond of the correct degree of hardness is necessary if a wheel is to retain its cutting properties. As to the grains themselves, these, when new, have sharp cutting points and edges, but with use the grains become worn and no longer cut freely.

If the worn grains are not shed, they should be, the wheel becomes glazed and then tends to polish and heat the work with but little cutting action. To restore the abrasive properties of the wheel, the old, worn grains must be removed and fresh, sharp grains exposed; for this purpose a wheel dresser is employed to break up the glazed

of the wheel's surface that can be treated. As a case in point, it was found that, when using this dresser, little more than $\frac{1}{4}$ in. of the sides of a 3 in. dia. wheel could be covered. As the wheel in question badly needed dressing, the tool illustrated in Fig. 2 was specially made for doing the work. The star wheels fitted to the holder are best bought from the tool merchant, for these fittings, to give satisfactory service, must be of the correct form and hardness. Two types of star wheels are shown in Fig. 4; that on the left is composed of three toothed wheels that are free to rotate on a central, hardened-steel bush. This form of wheel cuts rapidly and should be used when the grinding wheel is in bad condition. The other star wheel has the individual cutters separated by two steel discs; these discs serve

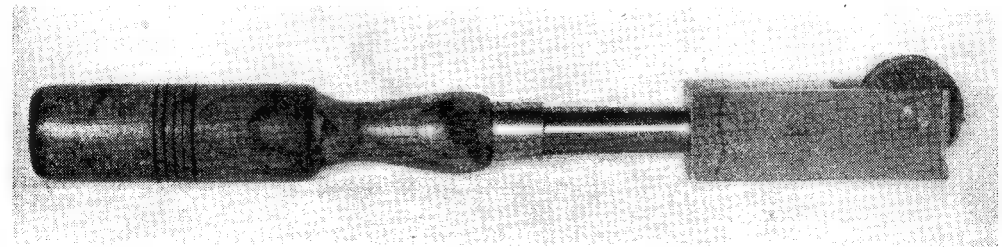


Fig. 2. The star-wheel dresser

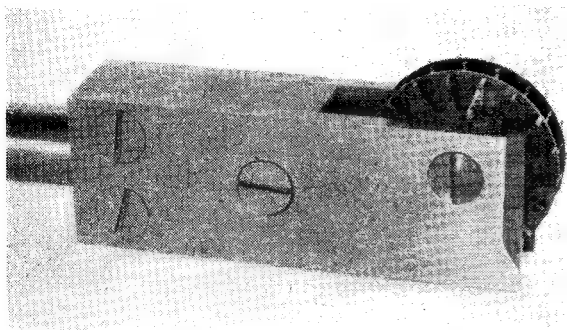


Fig. 3. Enlarged view of the head

to limit the cutting action and make the wheel well suited for carrying out the final smoothing operation, or for lightly dressing a grinding wheel that is not badly glazed or loaded. As by this means an appreciable amount of material can be removed from the surface of the grinding wheel, the dresser can also be used to correct slight out-of-truth running.

Construction

The dimensions given in the working drawings will serve for making a tool suitable for dressing grinding wheels of from 3 in. dia. upwards, but for use on large wheels the much heavier commercial type of dresser has the advantage of helping to damp out vibration. A start is made by cutting the two side members to shape and marking-out on one of them the positions of the four screw holes. After this part has been drilled with a No. 24 tapping-size drill, the two side members are gripped together in a pair of toolmaker's clamps so that the drill holes can be carried right through in accurate alignment. Next, one side member is clamped to the distance-piece or separator to enable this part also to be drilled. The thickness of the distance piece will depend on the length of the bush fitted to the star wheel, but ample end clearance should be given to ensure that the bush can rotate freely on its spindle. The drill holes in the distance-piece and the right-hand side member can now be enlarged to the clearing size and afterwards countersunk to receive the screw heads. The four drill holes in the left-hand member are tapped No. 2 B.A. It should be noted that the screw forming the pivot for the star wheel must enter on the right

side, so that, as the wheel rotates, the screw will tend to tighten. The parallel portion of this screw must be made a close fit in the right-hand side member, and when the screw is fully tightened the shoulder at its far end should butt against the inner face of the opposite side member. In addition, this screw should be case-hardened in order to resist wear.

The parts forming the fork and the wheel mounting are now ready for assembly, and the tool is completed by fitting the handle.

A Good Hand Grip

An ordinary chisel- or file-handle will be found to afford a good hand grip for operating the tool. The handle shaft is turned from a short length of $\frac{1}{2}$ in. round mild-steel; one end is shouldered down and then threaded $\frac{1}{2}$ in. B.S.F. to screw into the end of the distance-piece.

If the handle of a discarded chisel is used to form the grip, the chisel tang will serve as a guide when shaping the other end of the handle shaft. For this purpose, the new tang is turned parallel throughout its length, and the lathe top-slide is then set over for forming the taper. Four flats are next filed on the tang to enable the handle to fit on about $\frac{1}{2}$ in. short of the shoulder on the handle shaft. Stand the shaft vertically on a block of soft metal or hard wood in which a hole has been drilled to pass the threaded portion, and then drive the handle home against the shoulder with a mallet, but avoid using too much force or the handle may split. The tool is now complete, and the star wheel should spin freely when mounted in place with the pivot-screw firmly tightened.

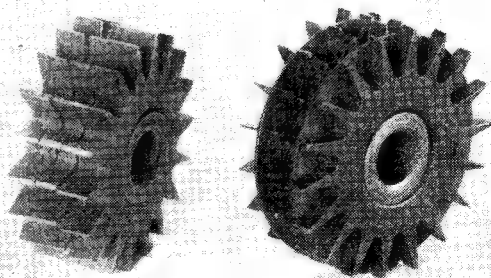


Fig. 4. Two types of star wheels

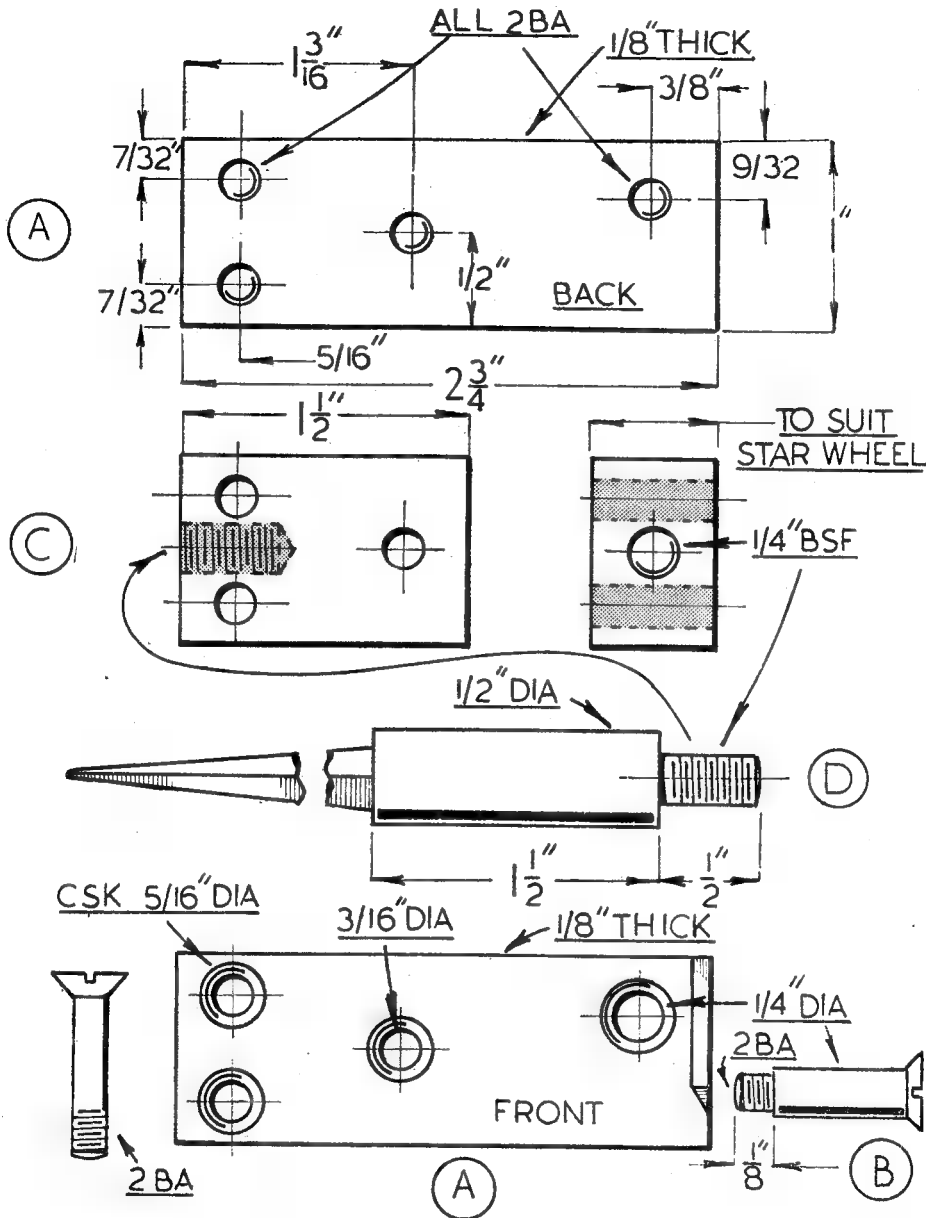


Fig. 5. "A"—the side members and fixing screws; "B"—the wheel pivot; "C"—the distance-piece; "D"—the handle shaft

To dress the side faces of the grinding wheel, the tool rest is set level, and the dresser should rest on the forward tips of the side members to obtain a bearing almost directly below the cutter teeth. Apply the tool boldly, keeping it square with the wheel, and make a traverse as nearly as possible in a straight line across the wheel face.

Stop the wheel from time to time to check progress, and continue the dressing until the wheel surface shows a uniform, fresh appearance. Needless to say, abrasive dust will be formed during the dressing operation, and any machines nearby should, therefore, be covered up and the dust finally swept up from the bench.

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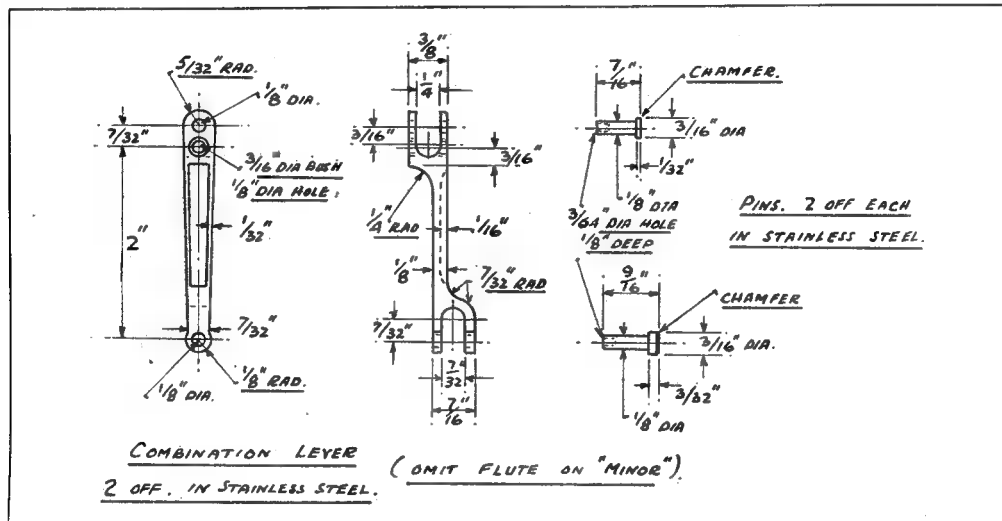
by J. I. Austen-Walton

Two 5-in. gauge locomotives, exactly alike externally but very different internally

IN the last instalment, I made no mention of the pins to be used in the various joints. These were shown, and are straightforward enough, but you may have wondered why I specified a pin with a drilled out end, and how it was to be fixed. In point of fact, a lot of thought has gone into the pins and their fixings,

joint, with the pin free to turn as it pleased. It is not very necessary for us to provide such joints for our job, nor is it even possible for scale or space reasons.

Another case against the fork pin that must not turn round, due to the absence of suitable bushes or bearing surfaces, is the difficulty found



and special considerations as to their removal if necessary at some future date.

The usual form of pin to be used in a forked joint is a bolt of sorts, of uniform diameter throughout its length, and a nut to go on it; it may also have a split-pin included in the outfit to prevent the loss of any of its parts through vibration or other cause. The bolt head need not be of hexagon form, but if there is a nut to tighten the other end, then some means of holding the bolt head, must be found. This, in its neatest and most convenient form may be just a couple of flats to take a spanner.

If it is desired that the pin should not rotate in the fork at all, then a different form of fixing must be found. When is this necessary? Mainly where the tongue, that goes in the fork, is bushed for wear, and the fork isn't; it may so happen that there is not room in the fork to allow for bushing, or that in a slender fork, the bushes would be too thin to be of serious use, or to stay in place securely. If it were possible to find room for both parts to be bushed securely, it would then become a "fully-floating" type of

in locking the uniform pin in a neat way; tightening the nut merely squashes the fork, and binding the joint sideways, which brings us to the stopped pin as shown. This, in its screwed version, can carry a nut that can be tightened *ad lib*, without damage anywhere, and furthermore, should the head on the pin get in the way, it can be dispensed with entirely, leaving the free side of the fork quite flush and clear.

For extra security, or merely for reasons of good appearance, a very slight head may be left, having only the tiniest increase in diameter and wafer thickness in head length. It does not need more than mere ridge (if needs are as severe as that) to make quite a slender fork end quite secure under all circumstances.

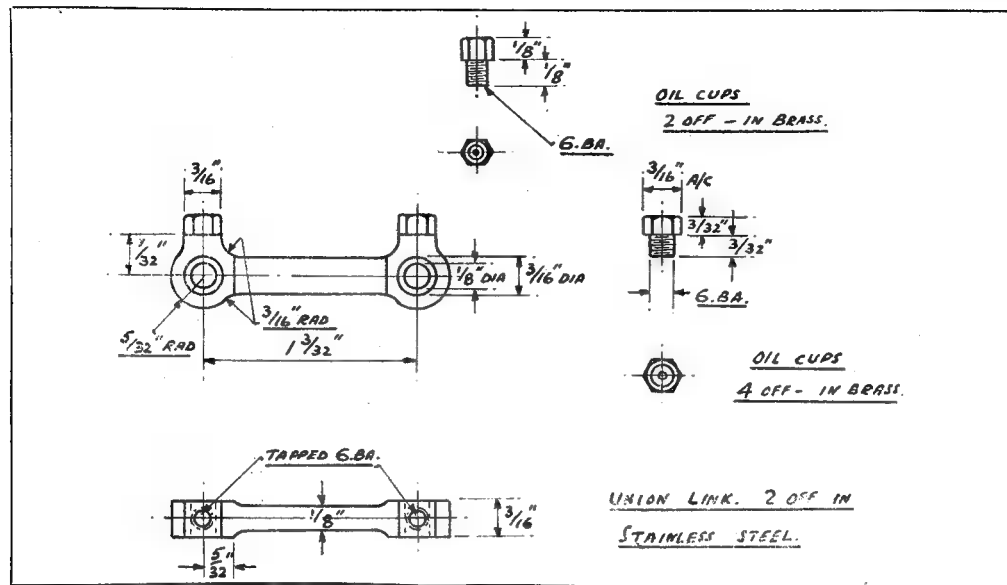
A fork with a slender head on the outside, looks a bit out of balance with a whacking great nut on the inside, and perhaps a split-pin chucked in for extra security, especially if the parts concerned are in the outside motion work, and the offending bits can be seen when viewed from above. Apart from that, split-pins are a bit of a devil to put in, in such circumstances, and not much more convenient when they have to be removed—and have you ever tried cleaning an engine with a nice piece of rag, where the


*Continued from page 741. "M.E." June 7, 1951.

said engine is simply smothered with split-pins, with nice, spikey ends?

The type of pin I have shown, has all the advantages enumerated above, but none of the disadvantages, except perhaps the view from behind (if that were possible with the works

through the fork, the lower pair are bushed. You will also notice that the milling out of the top fork has a round throat, which makes the drilling through of the lower set of holes, rather a bad case—even if drilled from both sides. If you drilled both these sets of holes first, complete



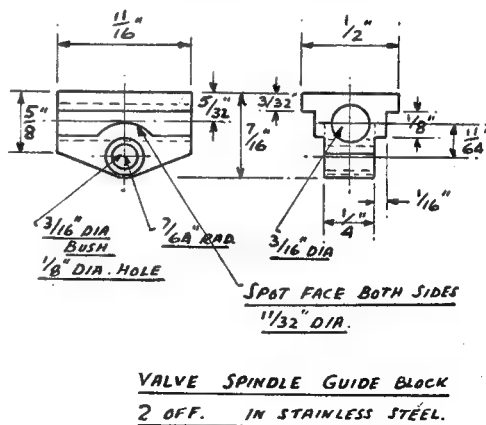
assembled). To fix, put in the pin, and with a punch ground something like a normal centre-punch, expand the hollow end of the pin which, you will notice, extends slightly beyond the fork face. The resulting ridge will prevent any movement in the pin, either laterally or rotationally, and the shouldering on the pin will prevent any collapse in the fork itself. The pin can be removed, either by drilling a tiny way down from the hollow end, or, if the fork is substantial enough—by just drifting it through with a pin punch, when the expanded ridge will be either squashed in or sheared off. It is perfectly certain that this type of fixing  never shake loose. For those who would still prefer to remain in the more or less orthodox school, a nutted pin (if there is room) can be substituted in every case.

Combination Levers

Most of the remarks made about the set-up for machining the radius-rods, may be applied to the combination levers. On coming to the part where the "levers-still-in-the-plate" have to be end-milled on the sides, to leave the metal for the swelled-out parts of the fork ends, the same procedure may be adopted in principle, but with one difference: Set the plate up at the fork end to be reduced (or lower end) on a piece of packing the thickness of the metal to be removed, repeating again for the other side; this will taper the whole plate to exactly the degree required, and without much trouble or work.

The upper fork might to advantage be left solid until the parts are broken apart. You will notice that of the two "lap and lead" holes

with the lower set bushed, you would find the milling out operation much less nerve-wracking. The problem of holding the lever whilst so doing, is increased unfortunately, due to the taper in the rod, but if the entire lever is held down by means of a pin fixing at the lower fork end, and the entire top end supported against a bit of scrap metal through which you mill as well, there should be no trouble in store.



The method of carrying out the taper flute has already been dealt with in this series, and there is no condition calling for different treatment here. Once more, "Minor" builders are excused altogether!

Union Links

These are the nearest relatives of the combination levers, and are possibly the simplest to make. There is no flute for either "Major" or "Minor," and their making could be classed as a simple evening's job. Anything to watch? Only that with the oil-cups fitted, the forward one must pass *right through* the lower fork of the combination lever.

Valve-spindle Guide-block

The next relative is the valve-spindle guide-block, which serves the multiple purpose of embracing the valve-spindle itself and providing adjustment thereto, by means of two nuts—one on either side; and of making an attachment point with the top set of holes in the combination lever, and finally, providing a top upper flat surface which forms the actual sliding member to work in a bracket member, yet to be described (sounds like a Patent Specification, doesn't it?).

Once again, I recommend a milled out section for sake of ease and uniformity, and in stainless steel for preference.

There are one or two minor snags or pitfalls that may be encountered, in spite of its innocent appearance; so here are my recommended machining methods, calculated to overcome them—or rather, prevent them. First of all, cut the milled section in two, facing up the ends of both pieces in the four-jaw chuck in the lathe. Now mark off exactly the centre of the long, transverse hole that carries the valve spindle and again mount up in the four-jaw chuck to bring this point or centre to run true; you should be reasonably sure of the truth of the jaws of your chuck, in that they run parallel and not bell-mouthed. As a rule, four-jaw chucks do not suffer from this trouble, mainly I feel, because they are not subjected to the more frequent brutality meted out to the three-jaw variety—but in any case, check up as best you can, or else take a chance. When you have got the job positioned, and the centre running true and checked by a dial gauge off the symmetrical edges, and your lathe will drill a *true* hole, then go ahead; if in doubt about this last point, then drill undersize, and use a tiny boring bar to bring the hole up to size.

The point is this: The hole must run true to the top face of the slide-block, and true to the side faces as well—that is—if you want the slide to do any of its intended duties in a satisfactory manner. Builders of "Minor" who will be permitted to round off the top of the block—trunk style, and omit the supporting bracket when it comes along, can be much more free and easy, and only the centres of the two drillings will be of consequence, and even then not critically.

Once the long hole is made, the job is nearly done, except for the hole for the bush that goes in the transverse hole. Unfortunately, this hole just breaks through into the long hole above, and in so doing, serves an unintentional purpose in providing a form of locking for the bush itself when the valve spindle is in place. If you are wary about the "break through," and feel confident enough in the fitting of a thinner bush, then do so. Do not forget about the spot

facing round the transverse hole, and as you will most probably do this with a pin drill, you would be well advised to perform this act before bushing the hole. The actual radius of the spot facing can be such that it will just provide clearance for the top of the combination lever fork, but see that the lever has plenty of clear movement without binding at either extremity—that's all.

If you decide to put in the larger bush, and bother the break through, then you will have to put a reamer through the long hole after the bush is fitted. With the valve spindle in position,

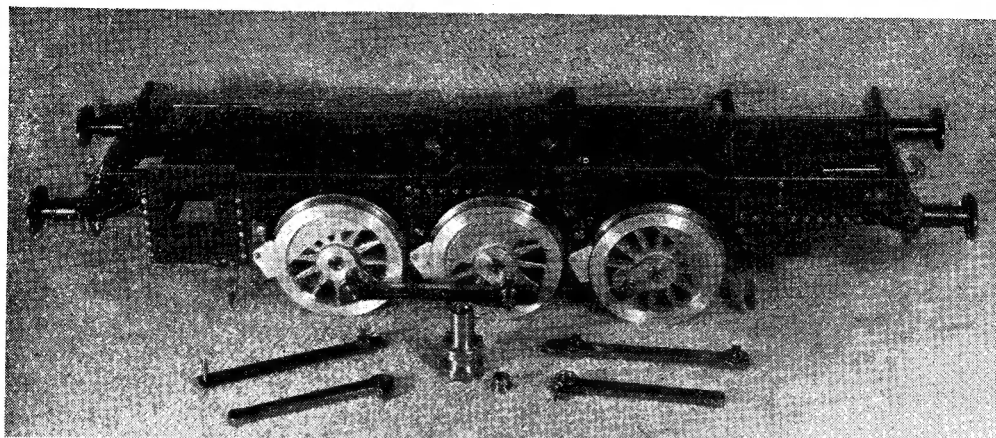


Mr. J. J. Sargent at work in his Dannevirke, New Zealand, workshop

you will see that the bush will not only be unable to move round, but also it will not come out when the fork is removed. Normally, with such a thin surround to the bush, it would be impossible to make a press fit of it without busting something, but by this method, a mere push fit with the fingers will fill the bill entirely. You could, of course, resort to silver-soldering, especially in the case of the smaller bush; so take your choice.

Haunted by Pumps

Just to change the subject for a little while, you will be interested and not a little alarmed to hear that I am being haunted by pumps—my twin-cylinder feedwater pumps; it seemed that by every post there came pictures of the pumps, taken in every light and from every angle.



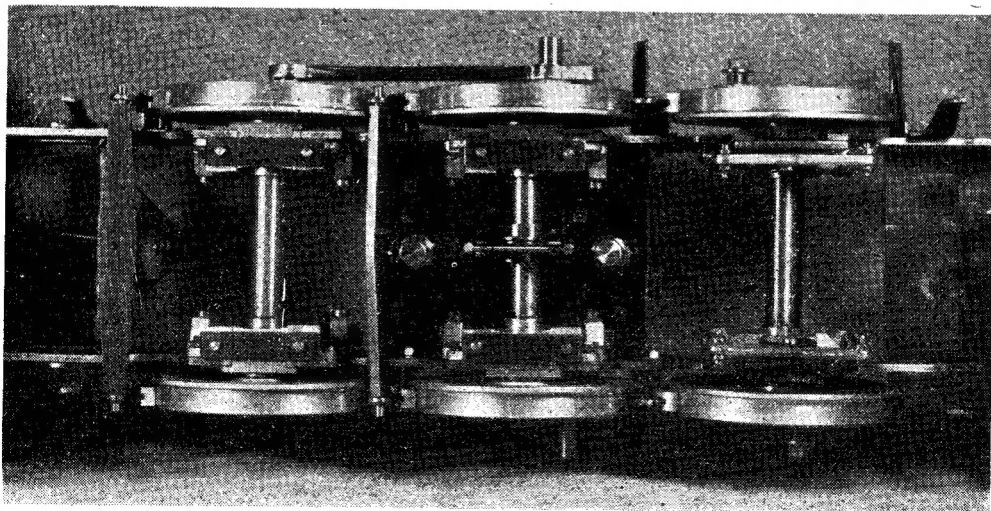
There were pumps with lubricators and pumps without them, pumps with drain cocks, pumps without drain cocks, pumps in bright metal, pumps painted, pumps as highly finished paper-weights, pumps with makers' nameplates, and heaven knows what else. But best of all, every photograph-sender has a good story to tell, and not a single failure to date—not even in the "serpent's nest" dept. Good show!

Amongst those who sent the pictures was Mr. A. A. Smith, of Streatham Hill, who added some latest shots of his "Major" to date. His efforts, judging from the pictures appear to be of a very high standard indeed, and he is to be much commended. He tells me that he won an S.M.E.E. Diploma last year, for the best work of the season, and I am sure it was a well-deserved honour. Later in his letter, he tells me that he managed to secure some of the special "Clupet" piston rings, specified for "The Sisters," by being tied down to ordering a dozen, and that if any readers would like to have the balance of the order, they can do so at cost to him, namely

—4s. 7d. each—fair enough. Oh, his address, here it is: 83, Emmanuel Road, Streatham Hill, London, S.W.12.

Here again, with our kind editor's permission, I may be able to reproduce some interesting shots of Mr. Smith's "Major" at a later date. But the reader who really stole the lion's share of my admiration this week, is a Mr. J. J. Sargent, who lives out in the wilds of New Zealand.

He also sent the photographs reproduced on this page, of his "Twin Sisters," including one of himself at work, seen on the previous page. Mr. Sargent wrote to me some time ago, explaining his position, and the difficulty he had in getting any materials at all. In the case of the wheel castings, he got over the difficulty through the simple expedient of making his own: the "foundry" comprised an old oil-drum, and a pail or two of coke (I wonder where he got the coke? Only readers in this country will laugh at this). But joking apart, for sheer go and determination, and the will to succeed, this sort of example makes good reading.



I even wonder whether I would do as well myself, in similar circumstances—I doubt it, somehow. By way of a message from this side of the world, and in which I know all other readers will join me, "jolly good luck, Mr. Sargent, and keep the good work going!"

Cylinder Castings

I hope, before many more days from now, that our mutual friends Kennion Bros., will have

a stock of the new and long-promised rust-resisting cast-iron cylinder castings; these may be followed by steamchests to match, and even piston and slide-valve material. But one thing at a time, and be thankful for small mercies, especially in these hard times. Please do not write to worry the life out of him; I'm sure he will announce the good news himself, when the goods arrive.

(To be continued)

PRACTICAL LETTERS

Chucks and Chuck Sense

DEAR SIR,—With reference to this article by "Scotia," published in the issue of April, 19th, I thought it a very good article except in one respect. In most engineering shops it is not allowed to use compressed-air to clean machines, as this blows any swarf or dust into slides, bearings, chucks, etc.

Yours faithfully,

Finedon.

F. H. NORTON.

The Model Fair

DEAR SIR,—I was very interested in the article and photographs by Clem Wise in a recent issue, that of May 24th, describing a model fair and circus. Although I am an engineer by trade, I find that with a growing family to support, I cannot afford "live steam modelling," and having turned to lighter materials, I also, am building a fleet of transport vehicles for a model fair. The interest of my family is largely centred in these vehicles, as indeed is mine, and self-propulsion is a "must."

I doubt whether I shall achieve anything like the general excellence of Mr. Wise and his colleagues; nevertheless, there is one small point on the vehicle side which I do dare to criticise. Granted that these are intended for general effect, it is a pity that having made such a nice job of the "Burrell" and "Garretts," the Foden leaves one uncertain as to whether it is intended to be converted wagon or an inaccurate ex-works tractor. If a converted wagon, then perhaps all is well, but certainly nothing like it left the Elworth Works under the name of "tractor." Information on this type of vehicle is now difficult to obtain, but the rear wheels of the "Foden tractor" were much larger than the front wheels. Actual tyre sizes were: Front—1030 mm. × 180 mm. section. Rear—1374 mm. × 180 mm. section twin.

The space behind the cab was not occupied by the winch or winding drum, but by the tank, which also carried two tool-boxes one on each side. Except in later models no mudguards were fitted to the rear wheels for obvious reasons. The winch itself, was on the rear axle. It was of the slip type fixed to a compensating centre. The drum carried 100 yd. of steel wire rope $\frac{3}{8}$ in. diameter and revolved at the same speed as the road wheels. I trust Mr. Wise will not be too discouraged by this correction.

Yours faithfully,

Waltham Cross.

E. N. SINDER.

Model Cars and Model Engineering

DEAR SIR,—I heartily agree with the sentiments expressed by "C. R. C." Cambridge, and Mr. Edgar T. Westbury, under "Practical Letters" in THE MODEL ENGINEER of the May 3rd, especially the last paragraph in the letter from "C.R.C."

Yours faithfully,

Exmouth.

A.D.S.

Camera Construction

DEAR SIR,—With reference to the recent correspondence concerning cameras, and particularly in connection with photographing models. From many years experience of photographing models and small components for reproduction and publication, I have as yet found nothing better than a $\frac{1}{2}$ -plate "Field" or "Stand" camera, with a good "Rapid Rectilinear" lens, well stopped down, and a long exposure on a comparatively slow plate.

Such a camera—for preference triple extension—used to be obtainable second-hand, very cheaply, but alas! they are to be found cheaply no more.

These cameras were a triumph of the cabinet-maker's art, but suffered from a very big drawback! They were designed to fold up into small space, and were, in consequence of this and their wooden construction, very flimsy; if great care was not taken in their handling—and particularly in folding them up, they were ruined.

Having suffered many mishaps in this manner, I designed and constructed a similar camera entirely out of aluminium, some years ago, and its success resulted in the construction of various others on similar lines.

Such cameras can be constructed without the use of a lathe, out of standard aluminium alloy rod, sheet, angle, etc., including the plate carriers or dark slides, and I had proposed to send in an article with full drawings for publication to THE MODEL ENGINEER, but it has been suggested that probably few readers will care for the expense of so large a camera, and that $\frac{1}{4}$ -plate would be more interesting.

I would be very pleased to have an opinion from readers on this point, and if sufficient interest is shown, to decide which size is the more attractive, I will be happy to submit for the editor's approval, an article with full drawings for the size chosen.

Yours faithfully,

Sheffield.

J. GORDON HALL.

An Ancient Boiler

DEAR SIR,—I have in my workshop a very old miniature locomotive boiler. It is $7\frac{1}{2}$ in. in length with a 2 in. diameter barrel, and 7 in. height to top of chimney.

There are eleven $\frac{1}{4}$ -in. fire-tubes and the firebox measures $2\frac{1}{2}$ in. \times $1\frac{1}{2}$ in. with wet sides.

The smokebox door is held in place by four wing-nuts, and this I thought worthy of a separate photograph to show the inscription on it, which reads: "Constructed by William Sinclair, Civil Engineer, Liverpool, July, 1842."

I believe the boiler to be all that remains of a model locomotive that originally had a 2-2-2 wheel arrangement, as the position of inclined



bolting holes for cylinders would suggest. The four holes in line on sides of firebox, and three similar holes on smokebox would be for attachment to frames.

Steam was taken from the forward dome on the boiler barrel, to a smokebox regulator, and through the projecting pipe below chimney to cylinders.

The safety-valve is over the firebox, a taper plug inside being held in place by cap when screwed into position. Maybe a reader in the Liverpool area will be able to throw some light on this interesting relic.

Weston-super-Mare

Yours faithfully,
M. V. STREET.

